
CERCA
Discover student research
2022
Celebration of Excellence in
Research and Creative Activity

Celebration of Excellence
in
Research and Creative Activity

(30th Annual Student Research Days)

Abstracts of Student Presentations

University of Wisconsin-Eau Claire

April 25 - 29, 2022

Davies Center

Acknowledgements

Many people helped to make this ***Celebration of Excellence in Research and Creative Activity*** possible, and we thank them for contributing their parts cheerfully and efficiently:

Beth Kranz - for helping create a BP Logix form for organizing CERCA.

Christine Henricks, the Davies Center Staff, and Event Production Crew for hosting and facilitating our events throughout the week.

Terri Knutson and the Sodexo Staff for many fine catered events throughout the week.

Evelyn Olson of the WiSys Staff for help with organizing Quick Pitch.

Timothy Nelson and of Mayo Clinic Health System for adjudicating the Mayo Choice Award Winning projects.

Catherine Chan, Kimberly Reed, Diana Cataldi, Max Clark, Lindsey Skogen, Krista Raleigh, and Sherri Miles, ORSP office staff members - for helping with myriad organizational details including compilation of this abstract book.

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.

Contents

A Note to Our Departments, Staff, and Students

Thank you so much for your patience while we complied our abstract book from CERCA 2022. It was exciting to return to a live celebration, but it also presented a strong learning curve with our new realities and precautions. Thank you to everyone who worked hard to make this week-long celebration of research at the University of Wisconsin-Eau Claire a success. Finally, a special thank you to everyone who participated in CERCA 2022. We appreciate every project involved in CERCA 2022!

Companion Events

31st Annual Mathematics Retreat

Hibbard Humanities Hall
April 25, 2022
8:30 a.m. – 5:00 p.m.

HHH 308

8:30 a.m. – 8:50 a.m.
Application of Complex Numbers in Modern Communication Technology
Nuo Xu

Sinusoidal signals and complex exponential signals (more accurately called imaginary exponential signals) are the most basic signals in modern mobile communication systems. The sine signal is often a carrier signal modulated by radio frequency, and the imaginary index signal contains two quadrature sine and cosine signals of the same frequency, which are often used in modern communication baseband digital modulation. Therefore, understanding sinusoidal signals and complex exponential signals is the key to the in-depth understanding of modern mobile communication technology, especially modern digital modulation technology. The signal is composed of sine waves, if we need to study the signal is composed of sine waves of those frequencies, the signal can be decomposed into the cumulative sum of sine functions. The Fourier transform can decompose the original signal function into an accumulated sum of sinusoidal functions. I will discuss the derivation process of the Fourier transform, which may include the derivation of the orthogonality of trigonometric functions, the derivation of the Fourier series, the discrete Fourier transform.

9:00 a.m. – 9:20 a.m.
Schrödinger Has More Than a Cat - Modeling Using the Wave Equation.
Christopher Bennett

Schrödinger's equation, published in 1926, is used to model wave functions in quantum systems. It is a powerful equation to use and even with assumptions, meaningful results can still be retrieved. In this presentation some of these assumptions will be explored along with their results. Some of the properties of the equation will also be explored.

9:30 a.m. – 9:50 a.m.
Proving the Fundamental Theorem of Algebra Using Complex Analysis
Kyle Eckland

The fundamental theorem of algebra is an important theorem in algebra. It states that every single-variable polynomial with complex coefficients has at least one root in the complex numbers. Equivalently, and more succinctly, it states that the field of complex numbers is algebraically closed.

While this theorem by its own admission pertains to algebra, it is possible to prove this theorem using complex analysis. Specifically, in this talk we'll be proving the fundamental theorem of algebra using Liouville's Theorem, which states that every bounded entire function is constant.

10:00 a.m. – 10:20 a.m.
Prediction of B-cell Antibody Binding Through Statistical Analysis of Epitope Variables
Kate Mueller, Payton Reiner

With the rise of the COVID-19 pandemic, research and discussion regarding vaccine development has become extremely prominent in today's world. This has caused many to question the processes occurring behind developing new vaccines. In this project, we used R Studio to analyze different variables of antigen proteins to predict which variables may contribute most toward whether a peptide will bind with cell antibodies. With the data set of variables provided, as well as our own coded variables, we used both a logistic regression model and an XGBoost model to find that peptide size, position, and hydrophobicity are the most important variables for predicting antibody binding. We will also present results from applying our models to a data set of COVID-19 antigens.

10:30 a.m. – 10:50 a.m.
Why'd You Have to Go and Make Things so Complicated:A History of Complex Numbers
Peter Spryer

A complex number z is defined as $z = a+ib$, where a and b are real numbers, and i is the square root of -1. In this presentation, we'll explore the origin of complex numbers. From the 16th century, with the first formal definition by Gerolamo Cardano, to the present day, the history of how complex numbers developed will be illustrated through examples from each century, including: solving the cubic equation, Euler's Formula, and calculating π from i.

11:00 a.m. – 11:20 a.m.
Applying Conformal Mapping Techniques to Problems Involving Fluid Flow
Cameron Johnson

In the realm of complex analysis, conformal mapping refers to a type of transformation of the complex plane in which angles between curves are preserved after mapping. This can be convenient for many applications, where a transformation can be applied to a problem to simplify its geometry, and the solution, and then undo the transformation to acquire the solution in the original coordinates. In fluid mechanics, this is useful for finding analyzing fluid potential flow around different shapes. In this presentation, we look at the problem of potential flow around a cylinder and discuss extending this example to study airfoils for aircrafts using a particular conformal map called the Joukowsky transformation.

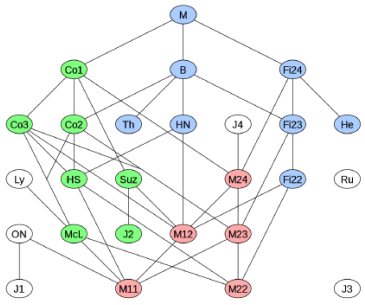
11:30 a.m. – 11:50 a.m.
How Graphing Games Can Be Effective in the Middle School Classroom
Lauren Heinz, Grace Liebl

As future secondary math educators, we have learned in our classes that technology is ever evolving in mathematics. With our presentation, we intend to investigate some specific ways we could implement these technologies in our future classrooms. One way we have seen some of these technologies introduced is through online mathematics games. We want to explore mathematical games related to graphing from around the Internet to determine if they are helpful educational tools, or simply a game. Prior to our presentation, we will have prepared a short video of how some of these games are played. We will explore how they could be used in a lesson during our presentation and how they can be effective to the learning process, if used appropriately. We are focusing on games not based solely on repetition and memorization, but based more on problem-solving skills without abandoning the mathematical concepts.

HHH 307

8:30 a.m. – 8:50 a.m.
The Monster Group
Gabe Hamilton

The totality of finite simple groups has been deconstructed and classifed. Each group belongs to a countably infinite family or is one of 26 sporadic groups. The monster group is the largest simple sporadic group. In addition, 20 sporadic groups reside in the monster. The goal of this talk is to understand what differentiates this monstrous family from the infinite families through an understanding of what a simple sporadic group is, and to understand why the monster group itself is so spectacular.



9:00 a.m. – 9:20 a.m.
The Use of Virtual Algebra Tiles in Intermediate Algebra
Katelin Nelson, Lexi Sexton

In our presentation, we will be discussing how to use different online Algebra tile programs to factor and distribute binomials and/or trinomials. As UWEC Math 10 and 20 tutors, we have seen first hand how difficult factoring and distributing can be for Algebra students, so we wanted to find a more visual way

for representing how to solve these expressions. If you find yourself currently struggling with, searching for a refresher on, or simply curious about a virtual, visual, and hands-on representation of factoring/distribution, this presentation was made for you! Together, we will spend most of our time experimenting with different Algebra tile websites to see how they can be useful in understanding factoring/distribution. So, we hope you decide to join us in discovering and playing around with how we can use virtual Algebra tiles to factor and distribute binomial/trinomial expressions. Also, don't forget to bring a laptop and try to watch our quick tutorial before you come!

9:30 a.m. – 9:50 a.m.
MarbleSlides: Teaching Transformations with Fun Exploration Technology
Cadie Ash, Josiah Ziebell

As mathematics students progress in grade level, the tools and toys that support student understanding of mathematics in an engaging way in the classroom frequently dwindle to only a graphing calculator. Secondary mathematics generally lacks the fun, playfulness, and trial-and-error present in elementary classrooms. Because of this disparity, educators in mathematics classrooms need to consider adding more play and exploration to their lessons. We are introducing MarbleSlides by Desmos, a technology that can be used to supplement mathematics teaching. This is an activity that gives students another look at translations and transformations for parabolas, but in a fun way! Our demonstration will show a more active and engaging activity that students can use to have fun completing challenges while strengthening their knowledge of parabolas. Each challenge gives students the ability to test their ideas and revise them before they move on to the next challenge. This activity seeks to build skills such as individually problem-solving while becoming familiar with the online graphing calculator Desmos. We hope future mathematics educators leave more willing to consider using hands-on, and engaging activities in their math classroom.

10:00 a.m. – 10:20 a.m.
Teaching Perimeter and Area with Physical vs. Online Technologies
Ally Wendt, Jill Bartelt

We will be demonstrating two ways to teach the difference between area and perimeter. The first method will be in the context of an elementary classroom and the second suited to a middle school classroom. First, for the elementary portion, we will use Geoboards for a physical and concrete way of learning. Second, we will discuss the same topic using the online tool Geogebra to illustrate a more advanced, abstract version. We will conclude with a discussion regarding the pros and cons of the two classroom tools. This presentation will help future educators not only learn ways to teach the concepts of area and perimeter but also will enhance their knowledge of technologies that can be used for a variety of other lessons.

10:30 a.m. – 10:50 a.m.
Examining the Hiring Challenges and Labor Force Shortage in Barron County, WI
Haitian Wu, Geboli Long

Many local businesses in Barron County have been struggling with hiring individuals recently. To determine what factors cause the shortage of employees, we investigated the demographics, housing,

transportation, and public safety of Barron County, and compared the data of Barron County with that of Wisconsin and the US. We found old dependency ratio at Barron County is too high, which directly results in the lack of labor. A solution to decrease the dependency ratio within a community is to promote immigration for younger people, maintaining and attracting younger generation to the community. Then, we analyzed the existing research data and concluded that household median income is highly correlated with the ratio of gaining and maintaining young generation. The findings of this proposed research will help to direct the local business and government to areas of improving labor force participation and assist in guiding future studies and investigation if necessary.

11:00 a.m. – 11:20 a.m.
Implementing CanFigureIt Geometry in the Classroom as an Introductory Activity to GeoGebra
Elliot Genteman, Jake Friede, Erika VanDerVoort

There are many challenges for middle and high school students to overcome when they first begin proof writing in Geometry classes. Oftentimes students' first experiences with proofs are formulating conjectures using GeoGebra or other classroom activities. CanFigureIt Geometry is a website which helps students learn to explore the basics of proof writing. It can serve as a great tool for student-centered inquiry based learning and might act as a more meaningful introduction to the new skill. CanFigureIt Geometry starts by giving students a set of justified claims, the students then must prove an unjustified claim by using a list of given theorems that are provided. CanFigureIt Geometry can also be used across many levels of learning. It includes theorems ranging from alternate interior angles all the way to tasks like finding inscribed angles in a circle. In this presentation we hope to highlight the benefits for students should teachers choose to introduce CanFigureIt Geometry into their lessons prior to other digital tools such as GeoGebra.

11:30 a.m. – 11:50 a.m.
Using Technology to Introduce Riemann Sums
Willem Van Haaften, Abigail Heinicke

Understanding the basic concept of an integral is an important step in learning its application. During this introductory phase, students will need to learn how to find the integral of an equation in a concrete or representational fashion before moving onto a more abstract approach. Riemann sums are a useful way to accomplish this task, but they can be tedious and sometimes frustrating when done by hand on pen and paper. To remedy this scenario, we propose using an interactive Riemann Sum applet in place of pen and paper. We will show an example of a Geogebra applet, made by user J Mulholland, that demonstrates Riemann sums in an interactive manner, which can aid students' understanding of the concept of integrals and demonstrate a method of estimating them. We will also incorporate this applet into a lesson plan designed to introduce students to Riemann Sums and begin to develop students' understanding of integrals.

12:00 p.m. – 12:20 p.m.
The Logistic Differential Equation with a Negative Harvesting Rate
Jacob Michael Hahr

The population growth equation $P' = kP(M - P)$ is often represented with a parameter h so that $P' = kP(M-P)+h$. This parameter represents the harvesting rate of a population as it grows over time. Bifurcation diagrams then relate the population at any given time to the parameter when $P' = 0$. However, solving this relationship leads to any negative h existing in the complex plane. This talk will show how Bifurcation diagrams behave in the complex plane and how it relates to the behavior of the differential.

HHH 318

8:30 a.m. – 8:50 a.m.
A Million $$ Question: The Riemann Zeta Function and Analytic Continuation
Duncan Koepke

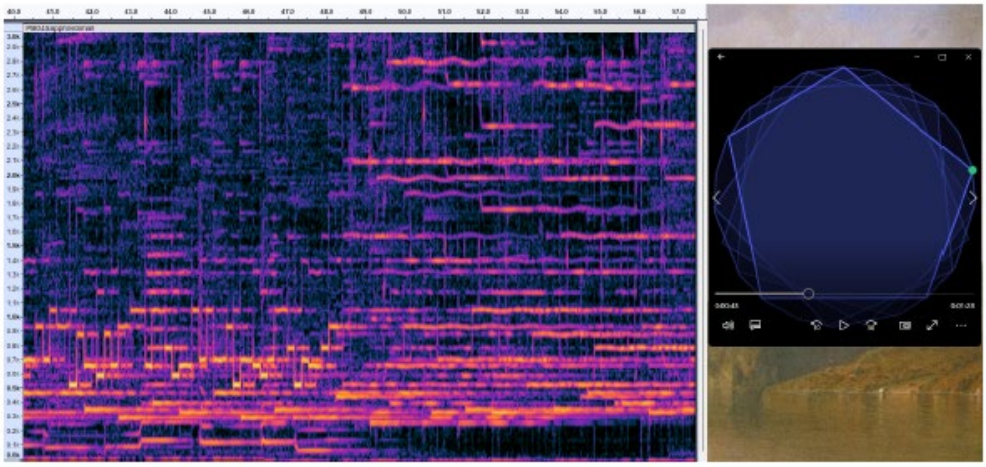
The Riemann Zeta function combines infinite sums and complex analysis very nicely. The zeta function is traditionally defined for numbers with a real part greater than zero. However using analytic continuation, the domain can be expanded to the complex plane, with notable exceptions. We will discuss the Zeta function and its analytic continuation, trivial zeros, and why people will say the sum of natural numbers looks like -1/12.

9:00 a.m. – 9:20 a.m.
Codebook Creation over the Real Addition Multi-Access Channel
Duncan Koepke

In coding theory, a multiple access channel is one where the messages of two or more senders are combined and then sent through a channel to a receiver to decode. After the senders select their message, there is a window for a malicious adversary to act. I will be introducing the problem that I have been researching. Additionally, I will be talking about how to design codebooks so that at least one sender's message can be recovered.

9:30 a.m. – 9:50 a.m.
Mathematics for Making Music!
James Walker

This talk will demonstrate a computer music generator that relies on geometry and modular (“clock") arithmetic. A video will be shown that illustrates a dynamic visualization of the melodic, harmonic, and rhythmic aspects of the sound coming from the computer music generator.



10:00 a.m. – 10:20 a.m.

Comparison of Cost-Effectiveness of Wind and Solar Power on Generating Electricity in Wisconsin

JunDa Zhao, Shi Qiao, Chengduo Gu

Global warming has emerged as a worldwide environmental concern since the pre-industrial era. Popularizing the application of renewable energy is imminent. Although being environmentally friendly, it should be cost-practical for the user as well. Our study focused on two types of clean and popular methods of generating electricity: Solar and wind. We compared the relative cost-effectiveness of the two methods working within time periods of 10, 30, and 50 years. We used corresponding formulas and applied various real-life factors for both methods to calculate the amount of electricity each could generate within the time periods, then constructed charts to demonstrate the comparison graphically. We have reached the conclusion that in general, applying wind power to generate electricity is much more efficient than using solar panels in Wisconsin. This might provide some insights on which method the state of Wisconsin should apply and develop in the future.

10:30 a.m. – 10:50 a.m.

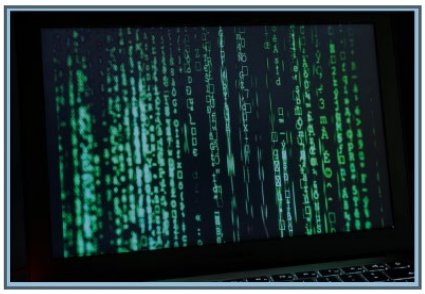
Trading Strategies Based on Fixed Investment Plan, Market Signals and Price Prediction Using Deep Learning Approach

Qianyu He, Zhongzheng Zhou

Digital cryptocurrency first emerged in 2009 and is a currently thriving open-source community and payment network. Its ecosystem is gaining lots of attention from business, consumers and investors. In this paper, we initially applied two strategies that are commonly in use in stock and cryptocurrency market, automatic fixed investment plan and trading at the “Golden-cross" and “Death-cross" points. We back-tested the market data from 09/16/2016 to 09/11/2021, the annualized rate of return generated by the automatic fixed investment plan, trading at “Golden-cross" and \Death-cross" strategy for gold are 10.1% and 10.68%. Then, we developed a third trading strategy based on the short-term market prediction using a Deep Learning model. The annualized rate of return generated by the automatic fixed investment plan, trading at “Golden-cross" and “Death-cross" strategy, trading based on short-term market prediction from a Deep Learning model for bitcoin are 10.1%, 98.77% and 128.18% respectively.

11:00 a.m. – 11:20 a.m.
Spear and Shield: Coding to Thwart Adversarial Aggression
Ariel Liu

In coding theory, we study methods to send information more effectively, for example, in telecommunications. Authentication is important when sending information to detect any potential interference. Our research is built on recent results on authentication with multiple users. We discuss some limitations for constructing good codebooks with certain achievable rates for partial correction in a two-user multiple access channel with or without adversary participation. We also explore other directions in this channel to satisfy our interests.



11:30 a.m. – 11:50 a.m.
Programmable Hash Functions and Their Applications
Sullivan Prellwitz

Programmable hash functions offer the unique ability to program the output of a type of function called a hash function such that it contains a diffcult-to-solve problem with a certain probability. Programmable Hash Functions allow us to create hash functions to be used in mathematical and cryptography proofs, which allow us to mathematically prove the security level of cryptographic schemes. We will discuss the background of what a hash function is, what a Programmable Hash Function (PHF) is, how they are constructed and evaluated, and their applications especially as they relate to cryptography and their toughness against a malicious actor.

12:00 p.m. – 12:20 p.m.
Creating Pictures and Diagrams with Tikz
Huston Wilhite

Pictures and diagrams are a vital component of mathematics. From diagrams to illustrate the concepts of calculus to the commutative diagrams of category theory, a good mathematical picture can often be worth infinitely many words. While most mathematics can be typeset beautifully and relatively easily using LaTeX, pictures often prove to be a challenge. The LaTeX package Tikz seeks to remedy this, by allowing the programmatic creation of diagrams from within a LaTeX document. We will explore the use of Tikz and how to leverage its unique programmatic drawing style in order to create very precise mathematical diagrams.

8:30 a.m. – 8:50 a.m.
Cryptarithms Cracked
Corey Boerner, Lauren Heinz, Kayla Daniel, Lance Lettner

We will discuss original, creative cryptarithmetic problems. This problem involves a mathematical puzzle and logical puzzle which are suitable for all students who know the basic rules of addition and subtraction. We will give the students an opportunity to get as far as they can on their own. We will then solve the problems together by introducing strategies, giving hints, and providing thinking time. A detailed solution to each problem will be provided towards the end of the presentation time where we will recap the processes to solve each problem.

9:30 a.m. – 9:50 a.m.
Who Owns What: The Cat, The Camel, The Frog, and The Dog.
Marissa Reynolds, Jaden Hiller

We will discuss a modification of the Einstein Problem (a matrix). This problem involves logical thinking and reasoning and is suitable for Math 365 students and any students who may find matrix puzzles interesting. We will solve the problem together by introducing the problem, providing thinking time, and giving hints. A detailed solution to the problem will be provided near the end of the presentation.

10:00 a.m. – 10:20 a.m.
The Five Codes
Nyah DeGroot

This will be the discussion and problem solving of a modification of The Four Codes problem. This problem involves matrix usage and is suitable for all students. At a unknown business 5 people have been assigned random names based on the color of their shirt but the boss mixed up every single color causing the name to not match their shirt. This problem will be to find out who's shirt matches who's name. We will solve this problem together by introducing the problem and giving hints. A detailed solution of the problem will be given near the end of the presentation.

10:30 a.m. – 10:50 a.m.
Neon Sudoku
Daniel Ellair, Brady Underwood

We will discuss a modification of the Sudoku problem. This problem involves logic, and number placement, and is suitable for all students. We will solve the problem together by introducing the problem, providing thinking time, and giving hints. A detailed solution to the problem will be provided near the end of presentation time.

11:00 a.m. – 11:20 a.m.
Matrix Logic Puzzles
Lexi Sexton

I will discuss a matrix problem also known as a logic puzzle or matrix logic. This problem involves using a chart to keep track of information and organizes it so we can eliminate possibilities and find the correct solution. This problem is suitable for all students, and we will solve the problem together. We will start by introducing the problem then providing time to think. I will also be giving hints along the way and a detailed solution to the problem will be provided near the end of the presentation.

11:30 a.m. – 11:50 a.m.
Cheating Royal Riddle
Paul Nickelotti

We will be discussing a modification of the Cheating Royal Riddle. This problem involves the use of probability in a unique way and is suitable for all students. We will solve the problem together by introducing the problem, providing some thinking time, and giving some hints. A solution to the problem will be provided near the end of the presentation time.

12:00 p.m. – 12:20 p.m.
Problem Solving: Adversarial Budgeting
Willem Van Haaften, Clara Krause

We will discuss a modification of the Traveler's Dilemma problem. This problem involves game theory, a strategy about making a decision based on constraints and the thought process of a rational adversary and is suitable for all students. We will solve the problem together by introducing the problem, providing thinking time, and giving hints. A detailed solution to the problem will be provided near the end of presentation time.

HHH 320

8:30 a.m. – 8:50 a.m.
Lie Groups and Their Algebras
Huston Wilhite

Symmetry plays an important role in mathematics and its applications, as exploiting it can often lead to dramatic simplifications of problems. Many familiar symmetries are discrete, such as the symmetries of a square, however there are also many examples of continuous symmetries. A clear example of continuous symmetry is the circle, but many other examples can be found such as the constants of integration in a differential equation. A natural description of these continuous symmetries is found within Lie groups and their algebras, collectively known as Lie theory (named after the Norwegian mathematician Sophus Lie). Lie theory has become a vital component of many applications of math, particularly theoretical physics. We will examine the basic ideas of Lie theory, its history, and its importance in modern mathematics.

9:00 a.m. – 9:20 a.m.
Optimizing Strategies through Simulation in Camel Up
Kyle Eckland, Matt Gilbert

Camel Up is a board game centered around earning money by betting on racing camels. Much of the research done into this game so far has involved using it to calculate probabilities and expected values in isolated and simple contexts. Now, we seek to better understand the game by studying optimal strategies for winning. To do this, we use simulations to analyze data from random sequences of turns in the game, and use theoretical methods to develop a foundation as to why these observations are or are not true. We then seek to use this information to analyze optimal strategies and explain why they're optimal.

9:30 a.m. – 9:50 a.m.
A Statistical Analysis of Strategies of Machi Koro
Dayna Morman

Machi Koro is a game where players take turns rolling dice and buying different properties, or cards, for their town. Each card has a number which corresponds to a dice roll. If a player rolls that particular number, they make money. There are many different strategies that can be used but players are often forced to think about probabilities and statistics throughout the turn. This project has aimed to study strategies of Machi Koro and code a simulation to analyze what properties of those strategies makes them good (or bad). By holding variables such as cost, probability of rolling certain numbers, and profit constant and using hypothesis testing to compare the win rates, we find that Machi Koro is much more than a game of luck and rolling dice.

10:00 a.m. – 10:20 a.m.
Colored Triple Linking Number
Ethan Olerich

In the 1950's Milnor introduced a powerful collection of tools, now called Milnor's invariants, to the study of link theory. Even the very first of these, called the triple linking number, has been the subject of fruitful and intense study ever since. Inspired by the work of Mellor-Melvin, which computes the triple linking number in terms of bounded surfaces, we present an extension of the triple linking number to colored links. A colored link is a link whose components have been decorated by colors. We apply this tool to generate obstructions to colored links bounding disjoint surfaces

10:30 a.m. – 10:50 a.m.
Analyzing Turning Points of the Airy Dynamic Equation via Time Scale Calculus
Scott Lawton, Erin Coonen

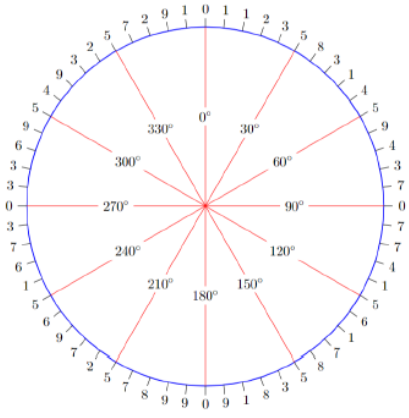
The purpose of this study is to identify and analyze behavior of turning points of the Airy Dynamic Equation, a discrete generalization of the classic Airy Differential Equation. Throughout the process, we appeal to the Time Scale Calculus, which allows for the unification of differential and difference equations. As a result, we are able to analyze the parameterization space and also describe the periodicity as well as other behaviors associated with various parameters in the discretization of the Airy equation. In this work, a brief introduction to the Time Scale Calculus and discretization methods will be provided.

11:00 a.m. – 11:20 a.m.

Particularly Peculiar Properties of Subsequences of the Fibonacci Sequence under a Modulus

Alyssa Franks, Javier Sanchez

Consider the Fibonacci sequence $(F_n)_{n=0}^{\infty}$, where $F_0 = 0, F_1 = 1, F_{n-2} + F_{n-1} = F_n$ for all $n \geq 2$. This sequence modulo m is denoted $(F_{m,n})_{n=0}^{\infty}$ where $F_{m,n}$ is the least residue modulo m of the term F_n. Our goal is to study properties of subsequences of the form $(F_{m,k+rj})_{j=0}^{\infty}$. In 2019, Guyer, Mbirika, and Scott studied the $m = 10$ case. They observed that for $r \in U(60)$, where $U(60)$ is the group of units modulo 60, the subsequences $(F_{10,k+rj})_{j=0}^{\infty}$ miraculously yield the parent sequence $(F_{m,n})_{n=N_{k,T}}^{\infty}$ either forward or reverse and up to some starting index $N_{k,r}$dependent on k and r. As of the time of the writing of this abstract, our research group has observed this phenomena so far only for m values 5, 6, and 10. It is our hope that by the time we give our talk at Math Retreat, we have a classiffcation of all m values exhibiting this phenomena. For m values NOT exhibiting this phenomena, we explore the particularly peculiar properties of the subsequences $(F_{10,k+rj})_{j=0}^{\infty}$ which are yielded--some of which, but not all, coincide with the parent sequence $(F_{m,n})_{n=N_{k,T}}^{\infty}$ running either forward or reverse for certain r values in $U(\pi(m))$.



11:30 a.m. – 11:50 a.m.

The Double Pendulum: A Brief Extension of the Single Pendulum

Duncan Koepke, Erika VanDerVoort

We will be discussing the single pendulum, and its extension the double pendulum, which is a quintessential example of chaotic systems. A chaotic system is one that is highly sensitive to initial conditions (i.e. a system where a slight change to the input will have a drastic change to the output). Using systems of differential equations and phase portraits we will be able to better understand the chaotic nature of the system.

9:00 a.m. – 9:20 a.m.
The Optimal Insect Eye
Dawn Paukner

What is the optimum form of an insect's compound eye such that the brain receives maximum information about the visual scene? Theorists in the mid-20th century have answered this question and described the mathematical relationships that govern the optimal conguration of ommatidia (i.e. units of a compound eye). In this talk, we will go through their findings and describe the equations that relate the size of ommatidia, the angles between them, and light levels in the environment. Furthermore, we will see whether evolution has produced the optimal eye based on these equations across several orders of insects.

9:30 a.m. – 10:20 a.m.
Window Mean Survival Time: Motivating Survival Analysis with Clinical Relevance
Mitchell Paukner

Modern clinical trials continue to employ decades-old analysis methods despite the nuances taking place in treatment development. As immunotherapies take the stage as the future of oncology, these old analysis methods, such as log-rank tests and the Cox proportional hazards model, limit the clinicians in the ability to maximize their resources. The delayed onset of treatment effect with vaccine style treatment regimens forces clinicians to either increase sample sizes to adjust for the loss of power incurred by methods that rely on satisfying the proportional hazards (PH) assumption, or perform analysis which conditions on survival past the time at which the treatment is expected to take effect.

Window mean survival time (WMST) evaluates the mean survival between a lower time horizon, tau0, and an upper time horizon, tau1. As a flexible extension of restricted mean survival time (RMST), specific clinically relevant windows of time can be assessed for survival difference accompanied by a communicable interpretation of estimates and tests. In its original application, WMST required the pre-specification of a window through the selection of appropriate window bounds, tau0 and tau1. In the instance of severe window misspecification, the analysis may suffer from low power and a less meaningful interpretation. In this talk, we introduce WMST along with its versatile tests whose procedures are based on the simultaneous use of multiple WMST test statistics. We will also discuss how the flexibility of WMST allows clinicians to tailor the design and analysis of their trials to specific goals motivated by clinical relevance.

10:30 a.m. – 11:20 a.m.
Destination Permutation
Emily Gullerud

The elements of different groups have different structures: elements of a dihedral group look like flips/rotations of an n-gon, elements of a cyclic group are equivalence classes of integers, and elements of a symmetric group are permutations. But what if I told you that everything I've just mentioned are really just permutations in disguise? We will see that every group is a permutation group, i.e. some subgroup

of the symmetric group. Not only that, but we will explore algorithms for actually computing what these permutations are!

11:30 a.m. – 11:50 a.m.
Panel Discussion on Graduate School
Emily Gullerud, Mitchell Paukner, Dawn Paukner

Are you considering graduate school? A panel of recent graduates will discuss their experiences as a graduate student and field questions.

12:00 p.m. – 12:20 p.m.
Snake Lemma
Nyan Toe Aung (Kenneth)

Snake Lemma is a tool that is fundamental in mathematics to produce long exact sequences in homological theories. As many theories are named after the founder, is the founder of the snake lemma named Dr. Snake? Snake Lemma is a key ingredient in showing that short exact sequences of (co)chain complexes generate natural long exact sequences in (co)homology. It is exciting to see a snake on the chalkboard while doing math.

12th Annual Andrew Balas Lecture

Hibbard Humanities Hall 100
2:00 p.m. – 3:00 p.m.

Code-Based Cryptography: Past, Present, and Future
Angela Robinson, National Institute for Standards and Technology (NIST)

Public key cryptography protects the privacy and security of our global digital communication infrastructure. All widely-deployed public key cryptographic systems are based on the difficulty in solving variations of the integer factorization and discrete logarithm problems. In 1991, Peter Shor presented quantum algorithms that could solve these problems significantly faster than classical computers. Consequently, a full-scale quantum computer would upend the security and privacy of our digital world. The National Institute of Standards and Technology (NIST) initiated a process to update current public-key standards to schemes believed to be quantum-resistant. NIST made a worldwide call for quantum-resistant public-key cryptographic algorithms and, in response, received over 80 submissions to be considered for standardization. NIST is currently in the 3rd round of analysis and 3 of the remaining 15 algorithms are based on error-correcting codes.

Error correcting codes were originally designed to improve communication across noisy channels, enabling the correction of errors introduced in transit. Messages are encoded by adding some redundancy in such a way that errors introduced by the channel can be removed from the received information, and then the receiver can decode (remove redundancy) to recover the original message. In the 1970's

it was discovered that cryptosystems could be designed based on error-correctingcodes if errors were strategically introduced by the sender so that only the intended receiver could decode. Due to the inefficiency of early schemes, these results were not actively pursued by cryptographers until decades later. In this talk, we will explore the foundations of code-based cryptography, the history of securing code-based cryptosystems, and role code-based cryptosystems could play in securing our digital world.

NOTA Review

Council Oak Room, Davies Center
April 25, 2022
1:00 p.m. – 2:00 p.m.

I'll Say
Grace Cunningham
Faculty Nominator(s): BJ Hollars

The Boy and the Girl
Emma Friend
Faculty Nominator(s): BJ Hollars

"Saint-Charles, Twenty-Fourth of April" (Fall 2019)
Charlotte Gutzmer
Faculty Nominator(s): BJ Hollars

"tangible things" Fall 2012
Taylor Kuether
Faculty Nominator(s): BJ Hollars

"Green Tomatoes" (Fall 2002)
Mai Lo
Faculty Nominator(s): BJ Hollars

"Grandfathers Drinking" (Spring 1994)
Tyler Croff
Faculty Nominator(s): BJ Hollars

"Two Sisters" (Spring 1983)
Elizabeth Willis
Faculty Nominator(s): BJ Hollars

Fireflies, Illusions from a Candy Cigarette
Maisie Beagan
Faculty Nominator(s): BJ Hollars
Loon Song
Elise Vitort
Faculty Nominator(s): BJ Hollars

"What We Used to Be"
Carlee Shimek
Faculty Nominator(s): BJ Hollars

L'isola
Rome Alfonsas Balciunas
Faculty Nominator(s): BJ Hollars

Distinguished Master's Thesis

Centennial Hall 4301
April 25, 2022
3:30 p.m. – 4:15 p.m.

"One Set of Lines to See, Another Set of Lines to Be":
Andrew Hussie's Homestuck as a Case Study on Author & Audience Authority in Participatory Hypertext
Colleen McCluskey, MA-English Literature and Textual Interpretation
Thesis Advisor: *Dr. David Shih*

Homestuck, a multimodal webcomic created by author and artist Andrew Hussie, has been long cited as an excellent example of modern hypertextual, participatory literature. Despite its ostensible audience participation and its potential to function as an activist space by uplifting marginalized voices, the work takes a significantly more conservative approach to the coauthoring between writer and readership. By performing a detailed analysis of Homestuck through the lenses of Reader Response Theory and Post-Structuralism—specifically the lenses of Critical Race Theory, paired with Gender Studies and Queer Theory—we can gain insight into the mechanics of power structures and their influence on the clash of authority between the author, audience, and the social norms that shape their perspectives through their consumption and interpretation of literary texts. The Interpretive Communities that shape the worldviews of both readers and writers are ultimately the key force in determining the meaning of a text. Neither the author nor their audience is a single authority, and by remembering this fact, we may become more cognizant of what it means to engage with literature in a meaningful and socially conscious way.

April 25, 2022
9:00 a.m.– 11:30 a.m.
Ho-Chunk Room, Davies Center

9:05 a.m. – 9:25 a.m.
Clark County Health Department and the Amish: A Community Partnership and Outreach
Luke Budrow, Alyssa Hanson, Jordyn Kulhmann, Holly LeBrun, Hannah Miller, Hans Peterson, Mya Polzer, Olivia Thieding
Faculty Mentor/Collaborator(s)*: Chelsea Collins, DNP, RN, CEN, SANE-A, Clinical Assistant Professor; Section 314, Clark County Health Dept., Neillsville, WI*

9:25 a.m. – 10:00 a.m.
Rosebud Immersion: A Dive into a Different Culture
Katie Bedbury, Bri Cline, Bayley Coronado, Bailey Davidson, Mik Devereaux, Joshua Domenech, Teagan Downs, Emily Foust, Ashley Hable, Shanna Hall, Julie Hertel, Quinn Hoyord, Emily Jacobs, Kate Klaustermeier, Emma Knutson, Abby Moynihan, Grace Neugebauer, Kinley Regan, Gabby Renk, Daine Riggins, Megan Scheibe, Alisyn Stevens, Julia Stier, Sydney Weber, Nicole Wolfe, Kari Zimmerman
Faculty Mentor/Collaborator(s)(s): *Lorraine Smith, DNP, RN, Assistant Professor and Josephine (Jodi) Arriola, DNP, RN, CCRN, NEA-BC, Clinical Associate Professor- Sections 312, 313, 381, Rosebud Sioux Tribe*

10:00 a.m. – 10:15 a.m. Break

10:15 a.m. – 10:35 a.m.
Partners in Health and Safety
Erek Devine, Kiefer Ekvern-Jamme, Morgan Hoffmann, Grace Johnson, Isabel McGerry, Kennedy Pawlicki, Morgan Richter, Anna Swanson
Faculty Mentor/Collaborator(s)(s): *Lisa Schiller, PhD, RN, Associate Professor and Lorraine Smith, DNP, RN, Assistant Professor- Section 311, Rural farms in West Central WI*

10:40 a.m. – 10:55 a.m.
Confronting the Ongoing Public Health Workforce Crisis
Megan Brewer, Katie Larson, Jordyn Londerville, Marlee Riehle
Faculty Mentor/Collaborator(s): *Sue Smith, MSN, RN, CPM, Clinical Instructor- Section 382- Wood Co Health Dept., Wisconsin Rapids, WI*

11:00 a.m. – 11:15 a.m.

A New Wave of Social Isolation and Loneliness Emerges after COVID-19 Pandemic

Louisa Darko, Sydney Eickhoff, Ashley Rudolph

Faculty Mentor/Collaborator(s): *Sue Smith, MSN, RN, CPM, Clinical Instructor- Section 382- Wood Co Health Dept., Wisconsin Rapids, WI*

Intercultural Learning and Research: Explorations of Culture and Identity (Study Abroad, Immersions, AIS, Hmong Studies, LAS, Etc.)

Ho-Chunk Room, Davies Center
April 26, 2022
9:00 a.m. – 1:00 p.m.

Language Revitalization Programs: What's Working? What's Not?

Madalyn McCabe, Aidan Sanfelippo

Faculty Mentor/Collaborator(s): *Wendy Makoons Geniusz*

This research investigates the successes, challenges, and themes of past and present Indigenous language revitalization programs to help build a foundation that current and emerging programs can use to succeed. This information was found in, but not limited to, books, articles, and interviews from successful individuals and organizations in the field of language revitalization, including Leanne Hinton's Bringing Our Languages Home: Language Revitalization for Families and an interview with Anton Treuer. This project was designed as preliminary research for a distinctive university-level course to teach university students about careers they could pursue in Indigenous language revitalization. This research could be useful for current and emerging language revitalization programs and for those thinking about working in this field. The overarching goals of these programs are to combat systemic oppression and to promote the reclamation of Indigenous culture that has been suppressed by colonization. Dr. Geniusz and her student collaborators have recorded successes and challenges of language revitalization programs, tips on funding, and structures of current and past Indigenous language programs. They have compiled them into a list of best practices for planning and implementing these programs, which are already being disseminated to various Indigenous language revitalization programs to bolster this process. This research was funded by a SOTL Grant.

Central European Travel Seminar: Challenges and Perspectives on International Travel During the Pandemic

Samantha Maurer

Faculty Mentor/Collaborator(s): *Jeff DeGrave*

Initially slated for June 2020, the Central European Travel Seminar (CETS) halted as the pandemic swept across the globe. From that point onward, CETS students, including myself, hinged on varying statistics and policies to determine not when but if we would ever set course to Europe. Nearly a year later, the university approved CETS. Three of the original CETS students and two professors were Europe-bound by July 2021. Of course, being the first approved immersion experience since the start of the pandemic

introduced new challenges. The five of us navigated new aspects to travel, such as antigen tests, proof of vaccination to enter establishments, PCR testing, and various social stigmas surrounding the pandemic. Though the presence of COVID-19 did create cause for some additional planning, I am beyond grateful to have studied in Central Europe for both educational and personal value. This presentation will highlight the challenges, differences, and alternative perspectives of COVID management in three different European countries.

The Decline of British Identity: The Rise of Regional Nationalism in the United Kingdom (1973-2016)

Jesslynn Sitko
Faculty Mentor/Collaborator(s): *Patricia Turner, Louisa Rice*

In the mid to late 20th century, British Identity appeared to be weakening in the face of growing regional identities in England, Scotland, and Wales. Many citizens believed British identity to be tied to accomplishments and the monarchy, but there is a more complex understanding of the idea of identity. This project focuses on the timeline from 1973 when the United Kingdom entered the European Union to 2016 when the UK referendum on membership in the EU was passed. Brexit reflects the weakening of British identity because England wanted to leave the EU and Scotland wanted to stay. Brexit brought to light the separate regional ideals within Great Britain. This project compares the sources of British identity such as the Monarchy and the royal family to the sources of regional identity such as the Miner's Strike of 1984, Margaret Thatcher, and regional nationalism of Scotland and Wales. It utilizes primary sources such as speeches from the Queen, referendum results, newspapers, and government acts. From the year 1973 to 2016, it is apparent that there is a slow decline in people who are in favor of being a part of the British identity. This decline is due to an increase in nationalism from Scotland and Wales, as well as events that affected people in negative ways such as the miner's strike in 1984, the influence of Margaret Thatcher, and European Union membership.

Analysis of Foreign Aid from the United States to the Democratic Republic of Congo

Grace Luloff
Faculty Mentor/Collaborator(s): *Damir Kovavevic*

In this paper, we will be exploring and analyzing decisions by the United States Government to provide humanitarian aid to the Democratic Republic of the Congo (DRC). We will be exploring the type of aid given, how it was implemented and spread through the country. To do this we will explore the complicated colonial history of the DRC as well as a summary of United States foreign policy as applied to Humanitarian Aid in Africa and other Developing Nations. This will be done through the analysis and support of Secondary sources that explain the various types of humanitarian aid, as well as Primary Sources from the United States government as well as people located in the DRC implementing the aid as well as those receiving the aid. All of this will be used to argue that the Humanitarian Aid given by the United States government is inefficient and unproductive, placing the DRC under more debt and forcing further dependency on international actors.

Attitudes and Perceptions Toward COVID-19 Vaccines among the Somali Population in Northern WI

Ellie Rose Decker
Faculty Mentor/Collaborator(s): *Mohammad Alasagheirin, Dr. Mary Canales*

Attitudes and perceptions toward COVID-19 vaccines among the Somali population in northern WI. The study's aim was to gain an understanding of vaccine acceptance and/or hesitancy within the Somali population. Vaccination rates are significantly lower among Black and Hispanic communities; those with lower educational levels; and those living in rural areas. This study's purpose was to explore a northern Wisconsin Somali community's attitude toward COVID-19 vaccines and examine factors associated with vaccine hesitancy and acceptance. Through qualitative methodology employing focus groups for data collection and inclusion of Somali interpreters, we explored the viewpoints of individuals within the Somali community regarding these topics. Focus group interviews were transcribed verbatim. The research team met regularly to identify themes. The overarching theme was Protecting self, others, and the community. Most participants accepted vaccinations, and the COVID-19 vaccine specifically, to protect themselves, others, and their community. Trusting local messengers including healthcare and public health personnel, valuing collective memory associated with previous communicable diseases, religious support of actions, and following protection advice all supported vaccine uptake. This study supports further research and methodologies to increase community outreach and establish trust between community members, healthcare workers, and public health personnel to promote public health and safety.

A Critical Incident Technique Approach to Understanding Ethnocentrism Reflected in USA's Political Role in Afghanistan from a Domestic Immersion Experience – A Case Study

Zachary Weerts
Faculty Mentor/Collaborator(s): *Kranti Dugar, Frances Hawes, Christopher Jones*

We posit that USA has been ethnocentric in its political approach in Afghanistan, failing to recognize and understand ethnic and heterogeneity inherent in the country's cultural fabric. Having spent upward of two decades in Afghanistan with the promise of ridding the country of organized terrorism and introducing universal human rights, the US has seen its state-building experiment fail. The purpose of this project was to study this ethnocentric approach following a domestic immersion experience with Afghan guests in Western Wisconsin. Through the application of the case study approach, the researchers hope to highlight the subcultural demographic and psychographic heterogeneity within the Afghan community. By applying a Critical Incident Technique (CIT) to the immersive experiences, we hope to understand the impact of this approach on the Afghan refugees, who were able to flee prior to the Taliban takeover, and suggest steps necessary to appropriately address the integration challenges the Afghan guests face now that they are in the US. We focus on both the political science and cultural implications by framing our immersion experience with the Afghan community post-August 2021. Our goal is to have the findings be useful for practitioners of both political science and anthropology.

The Impact of Population on Political Status of the Sámi in Norway, Sweden, Finland, and Russia

Tate Williams
Faculty Mentor/Collaborator(s): *Damir Kovačevič*

The growth in political agency available to Sámi peoples in the Sápmi region, encompassing the territory of Norway, Sweden, Finland, and Russia, since the 14th century has proven uneven. Previous research has explained the status of Sámi through the lens of domestic politics of each state or attributed loss of agency to nomadic/semi-nomadic cultures. This fails to incorporate the importance of population and population density within each Northern state. The status disparity between the four states and their Sámi populations is caused by national government form and domestic Sámi population. Population data from the three national Sámi Parliaments, legislation from four national governments and local policy of various regional governments will be analyzed to display the differing status of Sámi across the region from delineation of national borders in the 14th century to the age of globalization. The findings demonstrated herein will show the value of population and form of national government within the context of Sámi political status.

Spatial Perspectives on Hispanic Participation in Western Wisconsin Catholic and Protestant Churches

Benjamin Brown
Faculty Mentor/Collaborator(s): *Jeff DeGrave, Manuel Fernandez*

As the Hispanic population in the United States continues to grow, their important contributions are being experienced in all sectors of society. One of the many ways they demonstrate their influence is through high rates of nationwide participation in religious institutions, statistically displaying a greater allegiance to religious commitments compared to the national average (Pew Research Center 2011). Based on the prevalence of Hispanic peoples and their higher-than-average interest in religious activities, they may also play a role in increased participation and membership in religious institutions. This research project examines the impact that the Hispanic community is having on membership in Catholic and Protestant churches in western Wisconsin and how they are experiencing the church as a geographic "space". This research seeks to explore two key topics. First, the project will include a study of how the Hispanic population is contributing to church and parish membership in western Wisconsin. Second, it will employ a geographic analysis of Hispanic experiences in various churches, studying the church as a space of significance. Research will be conducted using scholarly reports, census data, and personal interviews.

A Critical Incident Technique Approach to Understanding the Afghan Electoral System from a Domestic Immersion Experience – A Case Study

Reece Vydrzal
Faculty Mentor/Collaborator(s): *Kranti Dugar, Christopher Jones, Frances Hawes*

The purpose of this project was to study the electoral system in Afghanistan following a domestic immersion experience with Afghan guests in Western Wisconsin. Through the application of the case study approach, the researchers hope to highlight the demographic and political divisions within the Afghan community. By applying a Critical Incident Technique (CIT) to the immersive experiences, we hope to understand the political science implications to cultural transformations within the Afghan refugee/guest community in the US by framing our immersion experience with the Afghan community post-August 2021, when the US pulled out of Afghanistan. Our goal is to have the findings be useful for practitioners of both political science and anthropology.

Council Oak Room, Davies Center
April 26, 2022
12:00 p.m. – 2:00 p.m.

Development of Biocompatible Surgical Foam for Utilization in Tumor Ablation

Grace Cunningham, Drew Smith, Marshall Apps, Kira Haus
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

In collaboration with Mayo Clinic Health System, undergraduate researchers at UW-Eau Claire have worked to produce and characterize a viable foam for utilization in tumor ablation procedures. Ablation is a minimally invasive surgical cancer treatment that uses a microwave probe to destroy specifically targeted tissue. Currently, saline and carbon dioxide are used to separate surrounding healthy tissues and prevent unnecessary damage. These materials are less than ideal as they do not maintain contact with the target tissue due to gravity. A biocompatible foam has been prepared and tested to address the drawbacks of saline and carbon dioxide. The stiffness and stability of foam as a function of time have been determined. The success of the lab tests has resulted in the advancement of the investigation; the materials have been successfully tested in vivo, and the process for testing in human patients has been initiated. Further research goals include expanding characterization of the foam using rheology and pendant drop tensiometry so as to quantify data for viscosity and elasticity, surface tension, and interfacial tension for peer-reviewed publication. Development and testing of the biocompatible foam aim to achieve significantly improved patient outcomes for ablative procedures.

Synthesis and Characterization of Stimuli-Responsive Polymers for Architectural Coatings via ARGET ATRP and Rheology

Kaylee Erickson, Hunter Koltunski, Carl Lundgren
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

The primary focus of this project is to conduct fundamental research on novel stimuli-responsive polymers, or smart polymers. These polymers can change physical properties in response to external stimuli such as temperature or pH. The goal of developing these novel polymers is to prevent particle aggregation in architectural coating formulas to reduce the number of particles needed to reach desired opacity. The polymer in focus is polyethylene glycol (PEG)-block-poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA), or PEG-PDMAEMA block copolymers. The polymers are synthesized in various target block ratios and molecular weights using Activator ReGenerated by Electron Transfer Atom Transfer Radical Polymerization (ARGET ATRP). To confirm synthesis, the polymers are characterized using Nuclear Magnetic Resonance Spectroscopy (NMR) to confirm the structure and Gel Permeation Chromatography (GPC) to determine the molecular weight and dispersity. A Discovery-HR-2 hybrid rheometer is used to find optimal polymer concentrations to achieve ideal viscosity and titanium dioxide particle dispersion, which is a method called demand curves. High-shear testing is also conducted to see how the viscosity of the suspensions change when subjected to high-stress applications. This research could benefit the architectural coatings industry by using less particles in manufacturing, reducing environmental impact.

Deep Learning Segmentation of Kidney Tissue Microarrays Using Infrared Spectral Imaging

Connor McKeown, Jordan Langlois, Zach Caterer
Faculty Mentor/Collaborator(s): *Rahul Gomes, Michael Walsh*

Renal function is an essential marker in the classification of renal disease and clinical symptoms of renal failure develop when there is 15% renal function. In this study, we used infrared spectroscopic (IR) imaging to investigate biomolecular markers from renal transplant biopsies. These images are used for the classification of regions of fibrosis from biopsies containing renal cell carcinoma (chromophobe and oncocytoma) and the prediction of fibrotic proliferation using biochemical signatures. IR spectroscopy is a diagnostic approach utilizing human tissue to label biochemical signatures. Images are captured in several hundred wavelengths in the infrared region of the electromagnetic giving researchers access to more information than traditional RGB images captured by a microscope. While images captured in several bands are great for disease diagnosis, it poses significant challenges for manual cell review by a pathologist. To address this issue, a fully automated pipeline for image processing is being explored. Preliminary research involves using Principal Component Analysis which returns the significant spectral bands necessary for detecting regions of fibrosis. After this feature selection step, a deep learning model called UNet will be applied for the segmentation and identification of fibrosis.

Comparison of Pathways and Detection Strategies for Pancreatic Ductal Adenocarcinoma (PDAC) Using Genetically Engineered Mouse Model (GEMM)

Ashleigh Kroschel, Olivia Heinecke
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Pancreatic ductal adenocarcinoma (PDAC) is a deadly, invasive pancreatic cancer. Currently, there are five central models used to investigate PDAC, namely, human PDAC cell line, cell line xenograft, patient derived xenograft, genetically engineered mouse models (GEMMs), and organoids. Cell lines don't represent the heterogeneous nature of PDAC nor the pressures of the human immune system making them less relevant than other models. Xenografts have a low engraftment rate making the number of models available exceedingly small, and organoids are still in development and analysis phase. In this research, we focus on exploring GEMMs, the most useful in biomarker discovery and specific gene mutations. Using these GEMMs, an in-silico model will be developed for simulating PDAC. Steps would include, developing a model, genetically modifying it, and predicting how often PDAC develops in the model to understand the importance of that gene in PDAC progression. Preliminary research revealed several detection strategies like PanIns, CA 19-9, stromal-related circulating molecules, biomarkers, and mitochondrial DNA. Some gene activity or pathways to explore may include COX-2, Notch pathways, MMP-7 expression, and MAPK pathway.

An Overview of Colorectal Cancer Detection and Prevention Using Machine Learning Techniques

Elena Bourget, Olivia Mahan, Emily Fenno
Faculty Mentor/Collaborator(s): *Rakib Islam*

The idea of using machine learning techniques to identify colorectal cancer is a relatively new one, with most of the research being done in the last ten years. To determine the current state of research in this

field, an analysis of a large number of research articles from Web of Science was performed. We aim to provide a comprehensive summary of the current state of colorectal cancer identification and prevention in order to understand the trend of research topics in the research domain. We do this through bibliographic analysis using Vosviewer, an automated visualization tool, on a variety of parameters. Our study will provide a foundation on which future research in the field of colorectal cancer detection and prevention using machine learning can be conducted.

Acute Impact of Resistance Exercise on Premenstrual Symptoms in College-Aged Non-Exercising Eumenorrheic Females

Elizabeth Packer, Grace Palubiski, Nevaria Rumery, Emily LaMarche, Emily Flaskrud, Ashley Hall

Faculty Mentor/Collaborator(s): *Jeffrey Janot, Saori Braun*

Premenstrual syndrome (PMS) includes cyclic characteristics of physical, cognitive, and behavioral symptoms and occurs in 90% of females. There is a growing need for research on how non-drug therapies can potentially mitigate PMS symptoms. In past literature, there is mostly an emphasis on aerobic exercise (AE). This study compares resistance exercise (RE) to AE and its acute effect on PMS. Participants were 11 college aged, non-exercising females who engaged in exercise 2 days before and during menses. A total of 4 exercise sessions were completed, 2 AE and 2 RE. PMS symptoms were tracked through a questionnaire pre-, post-, and 2-hours post exercise. A two-way ANOVA indicated a difference in *pain* at pre-menstruation ($p=0.034$) and during menstruation ($p=0.020$). For *negative effect* ($p=0.006$), *concentration* ($p=0.004$), and *water retention* ($p=0.004$), there was a significant change in symptoms pre-menstruation ($p=0.006$) based on timing of exercise. The difference between modalities (RE and AE) was not significant for any domain. There was no significant difference between the modes of exercise, indicating that AE may not be superior to RE when mitigating PMS symptoms. It can now be further supported to prescribe exercise as treatment to alleviate PMS symptoms before pharmaceutical means are needed.

Analysis of Filament Homogeneity in Composite Bi-2212 Wires

Evan Coursin, Kate O'Brian

Faculty Mentor/Collaborator(s): Matthew Jewell

$Bi_2Sr_2CaCu_2O_{8-x}$ (Bi-2212) is a superconductor capable of producing large magnetic fields for advanced magnet systems. However, fluctuations in the size and shape of Bi-2212 filaments in a composite wire can affect the flow of electric current in the wire and therefore the magnetic field produced. For this project, sample Bi-2212 wires were sectioned and imaged at several depth levels to assess the longitudinal homogeneity of the filaments. Image analysis using ImageJ was then used to threshold and mask the images, and then layer them on top of another to align the filaments. The changes in filament height, width, and area change through the layered images were observed and analyzed. General qualitative analysis suggests individual filaments can experience large changes in their shape, though more quantitative analysis is needed to determine the magnitude of these changes.

Exploring Policies to Promote High-Performance Computing in Post-Pandemic Undergraduate Education in Wisconsin

Molly Mohr, Isabella Doss, Jordan Herbert, William Kunkel- UW-Stout Student collaborator

Faculty Mentor/Collaborator(s): *Ying Ma, Rahul Gomes, Sudeep Bhattacharyay, Abhimanyu Ghosh, Anthony Varghese*

The COVID-19 pandemic has challenged higher education institutions across the world to maintain the quality of education and fulfill their mission. Notably, classes and research projects that involved high-performance computing (HPC) have been extremely successful in minimizing the impact of the pandemic. While HPC offers incomparable advantages in terms of preparedness for a public emergency, it is also becoming increasingly important in virtually every branch of social and natural sciences. Our scholarly goal for this project is to develop new policies for the UW System that will instantiate a shared model of HPC resources within undergraduate education across UW campuses. Our research methods include exploring global policies regarding HPC resources, surveying and interviewing UW students and faculty as well as industries, analyzing the survey and interview data, and producing policy recommendations based on our findings. Through this repository, we hope to develop an intuitive integration that will be beneficial for classroom use and data research and will also contribute to the progress of the community and local industries in Wisconsin.

Examining the Hiring Challenges and Labor Force Shortage in Barron County, WI

Haitian Wu, Quianyu He, Geboli Long, Zhongzheng Zhou

Faculty Mentor/Collaborator(s): *Wufeng Tian*

The COVID-19 pandemic has challenged higher education institutions across the world to maintain the quality of education and fulfill their mission. Notably, classes and research projects that involved high-performance computing (HPC) have been extremely successful in minimizing the impact of the pandemic. While HPC offers incomparable advantages in terms of preparedness for a public emergency, it is also becoming increasingly important in virtually every branch of social and natural sciences. Our scholarly goal for this project is to develop new policies for the UW System that will instantiate a shared model of HPC resources within undergraduate education across UW campuses. Our research methods include exploring global policies regarding HPC resources, surveying and interviewing UW students and faculty as well as industries, analyzing the survey and interview data, and producing policy recommendations based on our findings. Through this repository, we hope to develop an intuitive integration that will be beneficial for classroom use and data research and will also contribute to the progress of the community and local industries in Wisconsin.

The All-American Witch Hunt: Examining the Constitutionality of Venereal Disease Control from 1918 to the 1970's

Dana Athmann

Faculty Mentor/Collaborator(s): *Patricia Turner, Dr. Adam Kunz*

Among the many concerns of the United States government in the aftermath of the first World War, controlling the spread of venereal diseases, or sexually transmitted infections, was a notably high priority. In order to protect its soldiers, and the general public, from the dangers of ‘loose’ women, the government

promoted statutes, reforms, and movements geared toward the suppression of syphilis and gonorrhea – and consequently, the oppression of women across all ages, faiths, and ethnicities. The decades of compulsory examinations and involuntary detainment with no due process, raises the question: why was something seemingly so unconstitutional allowed to continue for nearly half a century? Most of the existing research on this topic focuses on the 'what' or the 'why'; that is: what types of treatments took place?; why were women considered suspicious and not men?; and what forms of propaganda were used? In contrast, this paper aims to use a constitutional lens to explore the 'how'. By using primary sources such as federal, state, and local court cases, records from the 65th and 75th Congress, and federally and state issued statutes and regulations, this project argues that the US government was able to circumnavigate the constitution in order to encourage and fund the modern-day witch-hunt of tens of thousands of women across the country. This argument is supported by three points of analysis: federal legislation, funding and support from the states, and the backing of the court system. For nearly 50 years, women in America were, quite literally, guilty until proven innocent. Their stories may not be well known, but they still deserve to be told.

Measuring Baseline mRNA Expression for Neuronal Marker Genes in Zebrafish Embryos Using qPCR

Cora Dunnum, Emily Vanderpas, Gillian Davis
Faculty Mentor/Collaborator(s): *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. The purpose of this project is to establish a baseline level of gene expression for a set of genes expressed in different types of neuronal cells in zebrafish. RNA has been extracted and isolated from zebrafish embryos at different developmental stages. This RNA will be converted to cDNA and then analyzed using gene-specific primers and qPCR. These results will be compared to established gene expression measurements in previous studies; we predict that the qPCR data will correlate with other reported gene expression measurements. Long-term we plan to use the expression patterns of these genes to inform experiments testing the impact of environmental and genetic factors of interest on neuronal development.

WiSys Quick Pitch

April 26, 2022
4:00 p.m. – 6:00 p.m.
Woodland Theatre, Davies Center

Floral Aromas and Funky Flavors, an Analysis of the X-Zyme Brewing Adjunct and Its Associated Enzyme Activity

Michael Brandt, Alec VandenHeuvel
Faculty Mentor/Collaborator(s): *Scott Bailey-Hartsel*

Adjuncts have been used for centuries to improve various qualities of beer. Enzyme adjuncts work by facilitating specific chemical reactions to attain results that would normally take much longer or not be possible at all without the adjunct. The X-zyme enzyme adjunct is intended to act as a beta-glucosidase and release glycosidically bound volatile terpene alcohols (VOC's) to improve aroma and flavor. When performing GCMS analysis to look for increased VOC profiles we also saw an increase in the level of 4-vinylguaiacol (4-VG). 4-VG is a "funky", clove-like, off flavor in beer that is usually undesirable. It has been characterized in the brewing community as a Phenolic Off Flavor (POF) which has been shown to rely on enzymatic decarboxylation to be derived from ferulic acid. With the knowledge that 4-VG is a derivative of ferulic acid, spectroscopic and HPLC ferulic acid esterase assays for in vitro and in situ X-zyme activity were developed. Both showed consistently higher ferulic acid content with X-zyme treatment. Results from our test brews suggest that there is little increase in terpene alcohols but when coupled with specific strains of yeast strains there is a large increase in the "funky" 4-VG aroma.

Working Together: Finding Ways for Hospitals and UW System Schools to Work Together to Prepare for Future Public Emergencies

Zachary Fellenz
Faculty Mentor/Collaborator(s): *Michael Walsh, Matthew Jewell*

In this project, we examine the relationship between UW-System schools and surrounding hospitals in relation to their separate and joint COVID-19 responses. This research and analysis will aid the UW-System by allowing us to be more prepared and knowledgeable in providing support to local agencies in the future when another emergency presents itself."

Detection of Inferior Vena Cava Filters on CT Scans Using an Artificial Intelligence Algorithm

Connor Kamrowski, Pavithra Mohan
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Inferior vena cava filters (IVCF) are placed to keep blood clots from travelling up to the heart, and they are designed to be removed. However, it is very common that IVCF retrieval doesn't occur, which puts the patient at risk of potential complications. This research aims to propose an automated deep learning algorithm which can detect IVCF from CT scans and alert healthcare professionals. A deidentified CT dataset was used from Mayo Clinic containing 90 scans with IVCF and 90 normal scans. Scans were obtained from radiology report texts and manually verified. Data preprocessing includes a 40cm crop from the lung bases, a uniform resizing to a resolution of 128x128x64, and an intensity crop to a range of 1 to 2500 Hounsfield units. Data augmentation was utilized to increase model prediction accuracy and reduce overfitting before scans were fed to the model. The model used for classification was a 3D UNet. The model had six convolutional layers utilizing different filters to extract relevant information from the scans such as texture, shape, and contrast. The model utilized 144 images for training, and 36 for validation. A training accuracy of 97.3% and validation accuracy of 94.44% was achieved.

Smartphones, Attention, and Brain Electrical Responses

Grace Thompson
Faculty Mentor/Collaborator(s): *David Leland*

Given concerns about how distracting smartphones can be, we are interested in how they affect attention-related brain electrical activity. Previous research demonstrates that the presence of one's smartphone impairs behavioral performance on an attention task. We are investigating whether the P300, an attention-sensitive component of brain electrical activity in the electroencephalogram (EEG), is suppressed in the presence of one's smartphone. We assess this while subjects perform an oddball task, requiring attention and responses to rare "target" stimuli among many task-irrelevant "standard" stimuli. Beta activity, i.e. brain electrical activity in the frequency range of 13-30 Hz, is another potentially useful measure since its amplitude/power is greater when an individual is more attentive or alert. Prior research has found increased beta power in nicotine-dependent individuals viewing a cigarette; likewise, we predict that subjects with relatively high use/dependence on smartphones will show greater beta activity when viewing their phone than a control object. By complementing behavioral measures with EEG we hope to advance the understanding of how smartphones engage and can affect attention.

Can a Wet Wipe Keep a Firefighter Safe after the Fire?

Esam Alfalah, Kelsey Cicigoi
Faculty Mentor/Collaborator(s): *James Boulter*

Firefighters accept a high level of risk in their profession. One underappreciated risk is their exposure to toxic and carcinogenic substances. According to a 2013 National Institute for Occupational Safety and Health study, firefighters have a 9% higher rate of cancer diagnosis and a 14% increase in cancer related deaths compared to the general public. Firefighters' dermal exposure to toxins found in soot is hypothesized to contribute to this increased rate of cancer. One way of mitigating that risk is the timely removal of these toxins from their skin. We are studying the ability of AfterFire wipes to remove a group of four compounds, frequently found in soot, from a human skin analogue. These compounds were chosen to represent the incomplete combustion of flammable materials (TCDD and BaP), firefighting foam (PFOA), and flame retardant (TCEP). Our analysis was developed from procedures published by the EPA and OSHA. Gas chromatography – mass spectrometry will be used to quantify the residue of the four characteristic compounds following a wiping procedure and subsequent solvent extraction. This project, a collaboration with a producer of medical products, represents a chance for UWEC students to work on a problem of industrial and societal significance.

Holocaust Archaeology: GPR Subsurface Imaging of the Mila 18 Memorial in Warsaw, Poland

Noah Hall
Faculty Mentor/Collaborator(s): *Harry Jol, Paul Bauman, Alastair McClymont, Jacek Konik, Philip Reeder, Connor Jol, Joe Beck, Richard Freund*

The Holocaust was the genocide of the Jewish people and took place from 1933 – 1945. In 1943, three years after the construction of the Warsaw Ghetto, marked the beginning of the Warsaw Ghetto Uprising which was successful. The main insurgents of the uprising were called the Jewish Combat Organization. The headquarters of this group was located under 18 Mila Street. On May 8th, 1943, the bunker was located and gassed. Civilians inside the bunker who were unable to escape surrendered, while the fighters

in the bunker committed suicide. This project aims to use ground penetrating radar (GPR) to investigate a site adjacent to the memorial in place of this event. A grid of 22m x 30m was collected in the field north of the memorial. 120 total lines were collected with a pulseEKKO Pro GPR system with antennae frequency of 500 MHz with a step size of 0.02m and a line spacing of 0.25m. The data was then processed with EKKO_Project software. Within the data there are patterns approximately 1m in depth that run across the entire 30m area. There are two identical patterns that line up with the location of the infrastructure of the old Muranowska Street that existed in 1943. This could either be a sidewalk of the road or the road itself. GPR is crucial in these studies due to the clear resolution it can provide of subsurface objects. GPR can help provide a clearer picture on what lies beneath the ground and this project does an excellent job of highlighting objects in the subsurface.

Development of Biocompatible Surgical Foam for Utilization in Tumor Ablation

Drew Smith
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

In collaboration with Mayo Clinic Health System, undergraduate researchers at UW-Eau Claire have worked to produce and characterize a viable foam for utilization in tumor ablation procedures. Ablation is a minimally invasive surgical cancer treatment that uses a microwave probe to destroy specifically targeted tissue. Currently, saline and carbon dioxide are used to separate surrounding healthy tissues and prevent unnecessary damage. These materials are less than ideal as they do not maintain contact with the target tissue due to gravity. A biocompatible foam has been prepared and tested to address the drawbacks of saline and carbon dioxide. The stiffness and stability of foam as a function of time have been determined. The success of the lab tests has resulted in the advancement of the investigation; the materials have been successfully tested in vivo, and the process for testing in human patients has been initiated. Further research goals include expanding characterization of the foam using rheology and pendant drop tensiometry so as to quantify data for viscosity and elasticity, surface tension, and interfacial tension for peer-reviewed publication. Development and testing of the biocompatible foam aim to achieve significantly improved patient outcomes for ablative procedures.

The First Generation Student Experience at UW-Eau Claire: A Case Study

Jaden Mikoulinskii
Faculty Mentor/Collaborator(s): *Jeff Erger*

"The First The First Generation Student Experience at UW-Eau Claire: A Case Study" aims to access how recruitment and retention efforts can be improved for first generation students at the institution. The population of first generation students is under-represented in campus media and recruitment initiatives nationwide. The study considers university-wide efforts and TRIO-based departments in order to understand how recruitment and retention can be improved for these students. The UW-Eau Claire campus will be benefited by having better recruitment and retention practices and having a solid understanding of how these students can have a positive learning and social experience at our institution. The project also considers current national standards and practices that are implemented at nationally acclaimed public universities. The research considers quantitative retention data, qualitative experiences and practices, as well as overarching goals within the university's strategic plan. This research is practical in that it should lead to implementation or cause change within our institution as a whole. Overall, this topic evaluates the greater issue of equity, diversity, and inclusivity within the university. The study

considers how the students themselves have felt during their college experience in terms of affordability, access to resources, and a sense of belongingness.

A Deep Learning Model for Pancreatic Ductal Adenocarcinoma Chemotherapy Outcome Prediction

Nichol He
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Pancreatic Ductal Adenocarcinoma (PDAC) is an aggressive abdominal malignancy, with an overall 8.5% 5-year survival rate. PDAC is often detected too late for surgical resection and associated with resistance to chemotherapy and radiation. Morphological characteristics of PDAC tumors can be extracted from CT scans and are associated with tumor characteristics and behavior. In this research, a deep-learning system for predicting chemotherapy outcome based on CT scans is being explored. To establish the foundation for this system, a comparative analysis between 2D-UNet and 3D-UNet has been performed. Experiments reveal 2D-UNet model to have higher accuracy in pancreas segmentation. To increase prediction accuracy, the effects of novel data augmentation techniques, including window level and cropping, have been utilized. By establishing techniques for standardizing CT scans from different datasets and using a flexible segmentation model, we aim to create a pipeline for pancreas segmentation followed by tumor extraction and staging using texture analysis.

The Effect of Empathy Perspective Taking on Racial Prejudice

Paige Panzehagen, Madelin Cieslicki
Faculty Mentor/Collaborator(s): *David Sparkman*

We look at how taking the perspective of someone in a racial outgroup with empathy can change attitudes towards that group as a whole.

Spatial Perspectives on Hispanic Participation in Western Wisconsin Catholic and Protestant Churches

Benjamin Brown
Faculty Mentor/Collaborator(s)(s): *Jeff DeGrave, Manuel Fernandez*

As the Hispanic population in the United States continues to grow, their important contributions are being experienced in all sectors of society. One of the many ways they demonstrate their influence is through high rates of nationwide participation in religious institutions, statistically displaying a greater allegiance to religious commitments compared to the national average (Pew Research Center 2011). Based on the prevalence of Hispanic peoples and their higher-than-average interest in religious activities, they may also play a role in increased participation and membership in religious institutions. This research project examines the impact that the Hispanic community is having on membership in Catholic and Protestant churches in western Wisconsin and how they are experiencing the church as a geographic “space”. This research seeks to explore two key topics. First, the project will include a study of how the Hispanic population is contributing to church and parish membership in western Wisconsin. Second, it will employ a geographic analysis of Hispanic experiences in various churches, studying the church as a space of significance. Research will be conducted using scholarly reports, census data, and personal interviews.

Hold On and Swipe: A Touch-Movement Based Continuous Authentication Schema

Laura Pryor
Faculty Mentor/Collaborator(s): *Rushit Dave*

In recent years, the amount of secure information being stored on mobile devices has grown exponentially. However, current security schemas for mobile devices such as physiological biometrics and passwords are not secure enough to protect this information. Behavioral biometrics have been heavily researched as a possible solution to this security deficiency for mobile devices. This study aims to contribute to this innovative research by evaluating the performance of a multi-modal behavioral biometric based user authentication scheme using touch dynamics and phone movement. This study uses a fusion of two popular publicly available datasets - the Hand Movement Orientation and Grasp (HMOG) dataset and the BioIdent dataset. This study evaluates our model's performance using three common machine learning algorithms; Random Forest, Support Vector Machine, and K-Nearest Neighbor reaching accuracy rates as high as 82%, with each algorithm performing respectively for all success metrics reported.

Analysis Of Filament Homogeneity In Composite Bi-2212 Wires

Evan Coursin
Faculty Mentor/Collaborator(s): *Matthew Jewell*

$Bi_2Sr_2CaCu_2O_{8-x}$ (Bi-2212) is a superconductor capable of producing large magnetic fields for advanced magnet systems. However, fluctuations in the size and shape of Bi-2212 filaments in a composite wire can affect the flow of electric current in the wire and therefore the magnetic field produced. For this project, sample Bi-2212 wires were sectioned and imaged at several depth levels to assess the longitudinal homogeneity of the filaments. Image analysis using ImageJ was then used to threshold and mask the images, and then layer them on top of another to align the filaments. The changes in filament height, width, and area change through the layered images were observed and analyzed. General qualitative analysis suggests individual filaments can experience large changes in their shape, though more quantitative analysis is needed to determine the magnitude of these changes.

Investigating the Internal Stratigraphy of Foredunes of the Duluth Barrier System: Application of Ground Penetrating Radar on Aeolian Landforms Critical for Protecting Vulnerable Lakeshore Communities

Mallory Woodle
Faculty Mentor/Collaborator(s): *Harry Jol*

The Duluth Barrier System (DBS) is a narrow spit of land west of Lake Superior, connecting Duluth, MN and Superior, WI. Lake Superior is important for economic and recreational means, but recent high lake levels threaten the infrastructure and livelihood of DBS coastal communities. Foredunes, shore-parallel dune ridges that form due to wind action, consist of sand that is deposited on the vegetated shore. Foredunes protect shorelines because they are situated along the beach where waves cause erosion. Ground penetrating radar (GPR) was used to analyze the internal stratigraphy of foredunes along the DBS. GPR is a non-invasive geophysical tool that sends EM pulses into the ground, to image the subsurface. Four lines were collected using the pulseEKKO Pro system at a 0.02m step interval, triggered

by the odometer, with a 500 MHz frequency antennae. Topographic data was collected with the Topcon RL-H4C laser level. Upon initial assessment and post-processing of the data, results are consistent with other previously conducted research and literature using GPR on foredunes. Dipping reflections suggest the occurrence of sediment accretion and erosion. The data will provide a better understanding of the internal stratigraphy of foredunes which will benefit DBS coastal communities.

Using Deep Transfer Learning for Unsupervised Image Segmentation in Remote Sensing

Pavithra Mohan, Matt DeWitte
Faculty Mentor/Collaborator(s): *Rahul Gomes*

As multispectral image resolution has increased, generating accurate segmentation of these images can pose a significant challenge. Another hurdle is the presence of accurate labeled data which can require hours of manual segmentation. One solution to this problem is the application of deep learning algorithms which are able to learn non-linear trends in the data without significant preprocessing. Deep learning models can also be used for transfer learning. In this research, we demonstrate transfer learning on how a model trained on one dataset can be used for segmenting a different dataset. We explore the widely known Potsdam and Vaihingen images to achieve our objective. Using a specific deep learning algorithm called UNet, we first train our model on a dataset with class labels. We then use the trained model to extend a custom UNet structure which is able to transfer semantic knowledge from the previous training and also adapt to the unknown images. Preliminary results indicate that there is a potential to achieve higher accuracy by using optimized loss functions suited for unsupervised learning along with pre-trained weights from the trained UNet model.

A 3D Printed Arduino Powered Electronic Barth Sextic

Samantha Maurer, William O'Brien
Faculty Mentor/Collaborator(s): *Silviana Amethyst*

During the summer of 2020, two undergraduate students at the University of Wisconsin – Eau Claire researched icosahedron symmetries found within the Barth Sextic, an algebraic surface featuring 65 double points. The Barth Sextic light fixture used in the study combines art and mathematics; this is most noticeable with the physical model of the surface utilizing 3D modeling and printing, Arduino, and Neopixel Jewel chips. In addition, the students contributed to the code that powers both the controller and fixture. With the controller, individuals can interactively explore the symmetries, namely rotations and reflections, by influencing the presence of colored light within each of the double points.

Restoration of the Salton Sea: A Stakeholder Engagement Model for Sustainable Development

Martin Kocher
Faculty Mentor/Collaborator(s): *Karen Mumford*

Over the past several decades, the Salton Sea in southern California has suffered from environmental degradation and lack of support for remediation leading to one of the largest environmental disasters in California. This environmental disaster was caused by unsustainable agricultural practices and real estate development and has widened social and health disparities among nearby Latino and Indigenous

residents. To restore California's largest lake, multiple parties across the private, public, and non-governmental sectors are collaborating to develop sustainable solutions. For this case study, a literature review was conducted to document the unique environmental and social history of the Salton Sea. In addition, a site visit to the Salton Sea area was conducted in Fall 2021 to identify key stakeholders and to examine the stakeholder collaboration process that developed to restore the lake. Information was collected about the stakeholders engaged in the process and then each stakeholder interest was categorized as meeting one or more of the three pillars of sustainable development, which are environmental, economic, and social. My case study highlights the importance of an inclusive stakeholder collaboration process and how this process can serve as a model for sustainable development.

Characterizing Recast Nafion® Film Solution Interface Diffusion and Kinetics in a Non-Aqueous System

Danielle Lehto
Faculty Mentor/Collaborator(s): *Krysti Knoche Gupta*

The effect of recast Nafion® films on platinum working electrodes in acetonitrile will be characterized by cyclic voltammetry and rotating disk voltammetry. The behavior of recast Nafion® films in acetonitrile has been observed to be different from the well studied behavior in aqueous solutions. The reversible redox couple of Tris(2,2′-bipyridine)ruthenium(II) hexafluorophosphate, Ru(bpy)32+, in an acetonitrile electrolyte solution will be compared between a bare platinum electrode and a recast Nafion® platinum electrode by cyclic voltammetry. In cyclic voltammetry the mass transport of the species is limited to the diffusion at the stationary electrode interface. In rotating the working electrode the limitation on mass transport is extended beyond the stationary diffusion. The current is limited by the mass transport of the species to the electrode interface where it can undergo redox, the limiting current of both a bare platinum electrode and of a recast Nafion® platinum electrode will be observed by varying the rotation. The diffusion interface of the electrode inside an acetonitrile solution of Ru(bpy)32+ and electrolyte will be determined by rotating disk voltammetry with both systems. The film thickness will be reported by rotating disk measurements.

Ab Initio Molecular Dynamics Simulations of Amorphous Metal-Polysulfides as Cathode Materials for Lithium Batteries

Jinkai Si, Meg Olson
Faculty Mentor/Collaborator(s): *Ying Ma*

Lithium-sulfur batteries offer a few advantages, including high energy density and low cost, compared to our current battery technology. However, the polysulfide shuttle effect, which is caused by various polysulfide intermediates formed during charging and discharging, hinders their commercial application. It has been shown that the formation of polysulfides can be hindered by amorphous metal sulfides, although a fundamental understanding is lacking. In this work, ab initio molecular dynamics simulations have been performed to investigate the structure and kinetics of several amorphous metal sulfides. A simulated melt-quench process was used to generate the structures of amorphous molybdenum and titanium sulfides with different sulfur concentrations. Different numbers of lithium ions were added at the cathode/electrolyte interface to simulate the discharging process, based on which atomistic mechanisms regarding the formation and diffusion of polysulfides have been revealed. Insights obtained from this work could help to develop new strategies to effectively inhibit the polysulfide shuttle effect, thus promoting the commercialization of lithium-sulfur batteries.

WGSS 496: Externships

Faculty Mentor/Collaborator(s): *Rose-Marie Avin*

Ho-Chunk Room, Davies Center
April 28, 2022
1:00 p.m. – 3:00 p.m.

Black and Brown Womyn Power Coalition
Halle Fischer, Sydney Connor

The Black & Brown Womyn Power Coalition, Inc. is a nonprofit organization that is focused on building strong leaders, families, and communities by providing training and resources through holistic and culturally responsive and appropriate approaches. Their mission is to build the capacities of Black and Brown advocates and their communities to end violence against womyn, queer and trans folx, and young people. They envision a bold healthy community led by liberated and powerful Black, Brown, womyn, queer and trans folx, and young people. Their Core Guiding Values are informed by life-long advocates working to end gender-based violence with a belief that those most impacted should lead the work.

Halle Fischer and Sydney Connor will be working on the Paj Yeeb Research Project. This project has the goal to honor and remember Hmong womyn who have been murdered because of gender-based violence. A national collection of information regarding these victims and the situations leading up to and following their deaths is important, both in recognizing their surviving families and identifying if there are commonalities that stand out and should be spoken of to increase awareness. While working with the Black and Brown Womyn Power Coalition, they will be gathering more information and create a database of Hmong individuals who have not yet been included or have very little documented about them.

The Chippewa Valley LGBTQ+ Community Center
Stephanie Janssen, Sara Nagel, Emily Ruschy

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.

Stephanie Janssen worked on the Safe Space Resource Guide. Janssen composed email templates that the Center will use to send out emails to businesses/entities who are interested in being included in the Resource Guide or to help spread the word about the Guide to gain more interest. Interested parties are encouraged to fill out a couple of forms that include what information that business/entity will provide for the Guide.

Sara Nagel will be working on the Pride event that takes place in June. She will be creating posters to be put around the space during Pride that has information from the 2021 LGBTQ+ Census Report. She will also help develop small activities that will be available to Pride attendees, making sure that there are activities for people of all age groups and interests.

Emily Ruschy worked on gathering data about the attitudes towards the LGBTQ+ community in the rural areas surrounding the Chippewa Valley. Ruschy also tried to find existing resources and other data for these rural areas.

Family Support Center/Center for Awareness of Sexual Assault (CASA)
Aja St. Germaine

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. Casa was established in 2003. It is a sexual assault support service that maintains a victim centered approach. They provide a safe place for people to come and talk about any issues that they may have about their sexual assault, or those of someone close to them.

St. Germaine collaborated with Family Support Center advocates to create a virtual presentation titled "Engaging with Challenging Materials: Maintaining Well-Being." This presentation discusses the neurobiology or trauma and why trauma responses can potentially be re-activated, and explores strategies for interacting with content in ways that are mindful of our individual and community needs. Additionally, St. Germaine designed posters for CASA's three support groups to consolidate and update the three previous posters.

The Community Table
Holly McFarlane, Olivia Rathsack

The Community Table's (TCT) 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.

Holly McFarlane will be working on the podcast of The Community Table. McFarlane will be involved in a variety of avenues, both technical, with engagement, and production-wise. Technically, McFarlane will be looking towards improving the sound quality and editing of the podcast to improve the overall listening experience. Production-wise, McFarlane was requested to give any tips they might have for the hosts/guests to ensure a smoother conversation during the episodes. McFarlane was also asked to help make a plan to boost engagement to the podcast, including expanding the platforms it is available to, creating a hashtag, creating ads, etc.

Olivia Rathsack will be working on the "Baby Shower in a Basket" project. Rathsack will contact community partners, solicit donations, and tour their buildings. Rathsack will be working on spreading the word to the recipients of the baskets about the different resources that exist within the community. Rathsack will design a brochure to pass out to the community partners and to those that receive meals every week at The Community Table, to spread the word about the project. Once they receive all the

donations, Rathsack be helping put together all the baskets and then planning an event to give out the baskets as well.

Western Dairyland
Lawren Deml

Western Dairyland Community Action Agency was established in June 6, 1966, under the Economic Opportunity Act to help disadvantaged individuals in Buffalo, Eau Claire, Jackson, and Trempealeau counties located in West Central Wisconsin. The agency's mission is to alleviate poverty related conditions and provide opportunities which enable people to advance economically and socially.

The agency works with individuals as well as community organizations to improve the quality of life for all. The agency is governed by a 24-member Board of Directors representing a cross section of the community. Eight members are local elected officials, eight are representatives of the low-income population, and eight are representatives of community groups and organizations.

Lawren Deml worked on researching various business counseling and Nominator(s)ship services around the community and Wisconsin area. This included interviewing various professionals in the industry and finding the right fit for Western Dairyland’s new program. The program is being updated to fit the new age of technology and the way Nominator(s)ing can be delivered as well as new programming for the program to function. Deml also worked on finding various ways of looking for Nominator(s)s and mentees and looking at community needs in the small business owners area.

CERCA Oral Presentations

Sciences and Mathematics

Menominee Room, Davies Center
April 27, 2022
10:00 a.m. – 12:00 p.m.

Wisconsin Women's Labor on the Homefront During the Civil War
Tiffany Goetz
Faculty Mentor/Collaborator(s)(s): *Joanne Jahnke-Wegner*

My project explores the missing history of women's labor in Wisconsin during the Civil War, particularly, the additional and invisible labors they performed in the absence of men. Historians of women's work during the Civil War era have examined women's movement into health and hygiene, including nursing and their work with the United States Sanitary Commission, their movement into industrial labor and government work, and the expansion of women's public economic roles during the market revolution, but what remains to be fully explored is how the war impacted women's work in Wisconsin, a state that was not significantly populated at the time. I conducted archival research to find primary source documents, including the diaries and letters of Wisconsin women, to better understand how their work changed during wartime. I argue that, regardless of social class, Wisconsin women's labor during the Civil War and Reconstruction expanded to include additional agricultural, economic, patriotic, and emotional labor beyond peacetime norms and in the absence of their partners.

Ab Initio Molecular Dynamics Simulations of Amorphous Metal-Polysulfides as Cathode Materials for Lithium Batteries
Jinkai Si, Meg Olson
Faculty Mentor/Collaborator(s)(s): *Ying Ma*

Lithium-sulfur batteries offer a few advantages, including high energy density and low cost, compared to our current battery technology. However, the polysulfide shuttle effect, which is caused by various polysulfide intermediates formed during charging and discharging, hinders their commercial application. It has been shown that the formation of polysulfides can be hindered by amorphous metal sulfides, although a fundamental understanding is lacking. In this work, ab initio molecular dynamics simulations have been performed to investigate the structure and kinetics of several amorphous metal sulfides. A simulated melt-quench process was used to generate the structures of amorphous molybdenum and titanium sulfides with different sulfur concentrations. Different numbers of lithium ions were added at the cathode/electrolyte interface to simulate the discharging process, based on which atomistic mechanisms regarding the formation and diffusion of polysulfides have been revealed. Insights obtained from this work could help to develop new strategies to effectively inhibit the polysulfide shuttle effect, thus promoting the commercialization of lithium-sulfur batteries.

Computational Screening of Organosulfides as a New Class of Cathode Materials for Energy Storage

Ziyan Yang
Faculty Mentor/Collaborator(s)(s): *Ying Ma*

Elemental sulfur is a promising cathode material for energy storage devices because of its exceptionally high energy density. However, lithium ions react with *octasulfur* rings in elemental sulfur to form various lithium polysulfides, giving rise to the notorious polysulfide shuttle problem. Recently, *organosulfides*, a new class of cathode materials with a relatively short sulfur chain stabilized by various functional groups, have been proposed, although their energy densities are much lower than that of sulfur. In this project, computational screening of *organosulfides* with varying sulfur chain length and different functional groups were performed. The open-circuit voltage and the energy density were determined using first-principles calculations based on the density functional theory. An optimal *organosulfide* with the highest energy density was identified, and a possible synthetic route was proposed. Our results could lead to the development of a commercially viable lithium battery with increased energy density and lower cost.

Analysis of the Beast Academy Comprehensive Curriculum

Madelyn St.Pierre, Maria Cruciani, Dylan Baker
Faculty Mentor/Collaborator(s)(s): *Jennifer Harrison*

Many widely used mathematics curriculums emphasize rote learning and procedures. In our research, we categorized and analyzed the Beast Academy curriculum tasks using Stein, Smith, Henningsen, and Silver's (2000) Mathematical Tasks Framework (MTF). The Beast Academy curriculum was developed with a focus on problem solving through monster characters in a graphic novel demonstrating different ways of mathematical thinking. Stein, et al.'s MTF categorizes problems based on cognitive demand, or the level of thinking a student would use to engage with a problem. Each member of our research team examined and categorized the problems throughout the curriculum based on the MTF. We hypothesized that we would see a pattern of increasing cognitive demand as mathematical topics were revisited. We will share findings from our analysis of the development of mathematical topics throughout the curriculum from the MTF perspective and future research goals to observe student engagement with the Beast Academy curriculum. Stein, M. K., Smith, M. S., Henningsen, M., & Silver, E. A. (2000). Implementing standards-based mathematics instruction: A casebook for professional development. New York: Teachers College Press.

Trading Strategies Based on Fixed Investment Plan, Market Signals and Price Prediction Using Deep Learning Approach

Qianyu He, Zhongzheng Zhou, Haitian Wu
Faculty Mentor/Collaborator(s)(s): Wufeng Tian

Digital cryptocurrency first emerged in 2009 and is a currently thriving open-source community and payment network. Its ecosystem is gaining lots of attention from business, consumers and investors. In this paper, we initially applied two strategies that are commonly in use in stock and cryptocurrency market, automatic fixed investment plan and trading at the ''Golden-cross" and ''Death-cross" points. We back-tested the market data from 09/16/2016 to 09/11/2021, the annualized rate of return generated by the automatic fixed investment plan, trading at ''Golden-cross" and ''Death-cross" strategy for gold are 10.1% and 10.68%. Then, we developed a third trading strategy based on the short-term market prediction using a Deep Learning model. The annualized rate of return generated by the automatic fixed investment

plan, trading at ‘’Golden-cross” and ‘’Death-cross” strategy, trading based on short-term market prediction from a Deep Learning model for bitcoin are 10.1%, 98.77% and 128.18% respectively.

Power of Collaboration: The Effects of Peer-Tutoring and Study Groups on Mathematical Anxiety, Self-Efficacy, Identity, and Mindset in Developmental Mathematics

Maria Cruciani, Grace Liebl, Katelin Nelson, Ethan Olerich
Faculty Mentor/Collaborator(s)(s): *Katrina Rothrock*

Student success is often associated with their mathematical identity, self-efficacy, anxiety, academic connectedness, and mindset. Deficits in any of these can have lasting repercussions. In developmental mathematics programs, it is challenging to find effective ways to provide sufficient academic support to the hundreds of students enrolled while also cultivating positive mathematical identities, mindsets, and self-efficacies. Our study examines how developmental mathematics students' perceptions about their mathematical identity, self-efficacy, mindset, anxiety, and academic connectedness are associated with their participation in study groups or in a tutoring center. Students enrolled in developmental mathematics had the opportunity to attend both study groups and a drop-in tutoring center. At the beginning of the Fall 2021 semester, students were invited to participate in a survey. At the close of the semester, participants took a similar survey measuring the same items as well as their perceptions of support throughout the semester. Over the semester, the research team tracked attendance. Data from the surveys will be analyzed using hypothesis testing to determine whether or not participation in study groups or tutoring significantly affects students’ mathematical self-perceptions. We expect a positive correlation between students’ participation in a study group or tutoring and mathematical self-efficacy, identity, and growth mindset.

Political Science, Languages and Arts

Menominee Room, Davies Center
April 28, 2022
10:00 a.m. – 12:00 p.m.

Unleashing the Inner Artist: Best Practices for Supporting Young Artists in a Collaborative Setting

Iris Redland, Avery Benson, Asiah Doyle, AJ Wielichowski, Sam Lakmann
Faculty Mentor/Collaborator(s)(s): *BJ Hollars*

Student success is often associated with their mathematical identity, self-efficacy, anxiety, academic connectedness, and mindset. Deficits in any of these can have lasting repercussions. In developmental mathematics programs, it is challenging to find effective ways to provide sufficient academic support to the hundreds of students enrolled while also cultivating positive mathematical identities, mindsets, and self-efficacies. Our study examines how developmental mathematics students' perceptions about their mathematical identity, self-efficacy, mindset, anxiety, and academic connectedness are associated with their participation in study groups or in a tutoring center. Students enrolled in developmental mathematics had the opportunity to attend both study groups and a drop-in tutoring center. At the beginning of the Fall 2021 semester, students were invited to participate in a survey. At the close of the semester, participants

took a similar survey measuring the same items as well as their perceptions of support throughout the semester. Over the semester, the research team tracked attendance. Data from the surveys will be analyzed using hypothesis testing to determine whether or not participation in study groups or tutoring significantly affects students' mathematical self-perceptions. We expect a positive correlation between students' participation in a study group or tutoring and mathematical self-efficacy, identity, and growth mindset.

Enacting World Language Instruction: Making Input Comprehensible

Megan Hinch
Faculty Mentor/Collaborator(s)(s): *Anne Hlas*

This study investigated a core teaching practice within world language education called Making Input Comprehensible through analyzing video recordings from the Annenberg Learner video library (2020). In recent years, much research has shown that maximizing the quantity of foreign language in the classroom is necessary, but not sufficient to increase student proficiency. Teachers must make their input to students comprehensible. Deconstructing the enactment of this core teaching practice, will provide much needed information to better understand the pedagogical moves that comprise it. Specific questions that guide this research included: How did teachers make input comprehensible? What were some of the natural sequences to making input comprehensible? Which strategies were most frequently used? The findings indicate that teachers across the grade levels are utilizing a multitude of strategies linked to comprehensible input: most commonly using gestures and asking questions. This research highlights the importance of comprehensible input and ways to effectively apply its strategies in the classroom.

Peter Pan: The Fascination with the Boy Who Wouldn't Grow up

Zachary Cambronne
Faculty Mentor/Collaborator(s)(s): Arthur Grothe

The purpose of this project was to analyze the story of Peter Pan through the lens of three questions. 1) What draws artists to return so often to this material? 2) How have the portrayals of the character of Peter evolved? 3) Why has there been a resurgence of this story in recent years? Since the story's creation in 1904, countless books, theatrical productions, film adaptations, and even psychological studies have been based on J.M. Barrie's original work. Through analyzing and comparing these adaptations, we sought to understand why this character remains present in our collective conscious. We discovered that while the "myth" of Peter has evolved into a light-hearted, nostalgic, "feel-good" tale, the original material has more tragic and darker undertones.

Creating Musical Mood Directive Recording Files

Tessa Ferry
Faculty Mentor/Collaborator(s)(s): *Lee Anna Rasar*

Tessa Ferry worked with Abbie Sonstegard, Jason Armstrong, Amber Atchison, and Lee Anna Rasar to create and record files of musical mood directive playlists. Ferry began working on the playlists during Fall 2020 with Faculty Mentor/Collaborator(s) Rasar and then worked with Sonstegard and Rasar during Spring 2021 to further create 15 sets of playlists for musical mood induction through a university grant. During Summer 2021 she worked with Armstrong and Atchison and Rasar on this grant to make and evaluate recordings of the playlists and to make revisions as needed for mood change effectiveness. Neuroscience research was used to sequence songs for each playlist to initially match negative feelings

associated with the COVID-19 pandemic and then emotionally redirect the listener to a more positive mood. Musical elements and properties such as tempo, key, orchestration, dynamic level, expectations, and more were used to create mood directive effects.

The Impact of Population on Political Status of the Sámi in Norway, Sweden, Finland, and Russia

Tate Williams
Faculty Mentor/Collaborator(s)(s): *Damir Kovačevič*

The growth in political agency available to Sámi peoples in the Sápmi region, encompassing the territory of Norway, Sweden, Finland, and Russia, since the 14th century has proven uneven. Previous research has explained the status of Sámi through the lens of domestic politics of each state or attributed loss of agency to nomadic/semi-nomadic cultures. This fails to incorporate the importance of population and population density within each Northern state. The status disparity between the four states and their Sámi populations is caused by national government form and domestic Sámi population. Population data from the three national Sámi Parliaments, legislation from four national governments and local policy of various regional governments will be analyzed to display the differing status of Sámi across the region from delineation of national borders in the 14th century to the age of globalization. The findings demonstrated herein will show the value of population and form of national government within the context of Sámi political status.

Developing Learning Packets for the Influence of Music on Behavior

Lauren Casey, Tessa Ferry
Faculty Mentor/Collaborator(s)(s): *Lee Anna Rasar*

Tessa Ferry and Lauren Casey worked with Lee Anna Rasar by creating learning packets and assessing materials to use for the course Influence of Music on Behavior which was being taught for the first time exclusively to non-majors. Assessment areas include teaching delivery modes using lecture/demonstration, videos, text readings with questions, and integration of graphics into the presentation of course materials and the assessment modes used for assignments/quizzes. Types of structures used for teaching delivery and for student assessment are being evaluated for their effectiveness in student learning to determine what structures are the most successful.

CERCA Performances and Films

Woodland Theatre, Davies Center
April 27, 2022
12:30 p.m.

Scoring a Pandemic
Samuel Stein, John Ford, Emma Campbell, Sam Lakmann, Gabrielle Etes, Jess Peterson
Faculty Mentor/Collaborator(s)*: Chia-yu Hsu*

This project chronicles our experiences as musicians when the COVID-19 pandemic hit. As students in composition, our project is split up into four distinct musical movements that represent the emotions felt in the year 2020: Surprise, Levity, Grief, and Hope. The ensemble we chose was based on the few musicians that stayed in town over the strange and unprecedented time; it is a sextet formed by piano, guitar, violin, clarinet, French horn, and voice. Our research started in understanding how to orchestrate this unique ensemble, then continued into the hands-on compositional aspect. The project title stems from our interest in film scoring and representing events and emotions through the technique of recurring motives. We also used contemporary music in our research, which inspired us to use more unique compositional methods for conveying unique situations. An example would be extracting the lyrics from emails the school sent and articles written about mental health during the pandemic. The final steps in our process were to rehearse and record our piece, *Scoring a Pandemic*.

Woodland Theatre, Davies Center
April 28, 2022
2:00 p.m.

The Good Nazi: Communicating UWEC's Undergraduate Research with Film
Luke Burds, Joe Beck, Ricky Mataitis
Faculty Mentor/Collaborator(s): Harry Jol, *Alastair McClymont (BGC Engineering), Paul Bauman (BGC Engineering), Jacek Konik (Warsaw Ghetto Museum), Philip Reeder (Duquesne University), Connor Jol (University of British Columbia), Joe Beck (University of Wisconsin-Eau Claire), Richard A. Freund (Christopher Newport University), Kayla Singleton (Christopher Newport University), Mikaela M. Dettinger (Christopher Newport University), Colin Miazaga (BGC Engineering Inc)*

In recognition of Yom HaShoah, the film tells the story of Major Karl Plagge, a Nazi officer who, during the Holocaust, was commandant of a forced labor camp called "HKP" in Vilnius, Lithuania. In reality, he was sheltering hundreds of Jewish families. By the end, many were saved in hiding places dug into the ground and carved into the walls. Many more were executed by the SS and buried in a mass grave. Today, the former "HKP" is unchanged. A group of scientists, including UWEC faculty and undergraduate students, arrive to locate the hiding places of those that were saved and identify the mass grave of those who were murdered. A child survivor of the camp and an American physician, whose mother was saved by Major Plagge, join them. The film tracks their three stories and, ultimately, brings to light the unknown tale of a Schindler-type German who listened to his conscience, instead of his superiors.

Haas Fine Arts Center 190
April 28, 2022
5:30 p.m.

Confluence Dance Project Preview: Choreographer Q & A
Ellie Eswein, Megan Her, Eliassah Larson, Anna Loughridge, Ruby Sonneck, Lexi Stock, Emma Wagner, Skyler Schad, Noelle Snesrud, Jazzlynn Dubay
Faculty Mentor/Collaborator(s): *Ariella Brown*

CERCA 2022 Poster Presentations

Ojibwe Ballroom, Davies Center
April 27, 2022, 4:00 p.m. – 6:00 p.m.
April 28, 2022, 2:00 p.m. – 4:00 p.m.

Art & Design

Ceramic Firing Alternatives to Electric Kilns
Cassidy Baranek
Faculty Mentor/Collaborator(s): *CV Peterson*

This project is intended to experience traditional ceramic firing methods. Most ceramic artists today rely on electric kilns that are able to self-regulate and provide more predictable consistent results. This research is meant to reintroduce traditional art techniques to maintain the unexpected results of historical pottery. Through collaboration with several local artists as well as research into traditions of potters throughout time I have collected information on the processes required for several methods of firing. With this research I hope to apply the methods to my own pottery. Documentation of the process along with sets of similar ceramic forms allows me to record the variations produced within each firing. I have experimented with pit-firing documented wood-firing and completed a set of works that utilize a gas kiln. I hope to reinstate the unpredictable unique results of less regulated firing methods.

Biology

Investigating the Development of Social Preference in Larval Zebrafish
Nichol He
Faculty Mentor/Collaborator(s): *Bradley Carter*

Adult zebrafish demonstrate various social behaviors in the presence of members of the same species. This set of social behaviors is not observed in young zebrafish larvae. The development of social behavior in zebrafish larvae has been reported to occur within the first three weeks of life. The accurate measurement of this behavioral transition will be useful for examining the effects of genetic and environmental factors on the development of social behavior. We attempted to replicate a published assay designed to measure social preference in zebrafish larvae in the first three weeks of life. In a custom behavioral arena zebrafish were able to freely move between two chambers one containing a conspecific and one without. Social preference was evaluated by comparing the time spent in either chamber using Noldus DanioVision motor tracking unit with EthoVision software. However, we were unable to replicate the reported development in social preference across the first four weeks of life. Instead, our study suggested that there is no significant change in social preference during the observation period. We also do not observe any significant changes in social preference before and after the addition of a conspecific. These results raise questions about the utility of this assay for measuring social behavior in larval zebrafish.

Screening for Novel Antibiotic Producers

Danielle Zahn, Lizzie Nelson
Faculty Mentor/Collaborator(s): Daniel Herman

The continual emergence of antibiotic resistant microbes is of great concern in the medical community. Many pathogenic bacteria previously susceptible to common antibiotic treatments have evolved resistance resulting in serious medical and public health concerns. Infections caused by these resistant bacteria are not only costly but difficult to treat. In response to this growing crisis we aim to identify novel antibiotic producing microbes that we have isolated from soil samples. These samples have been collected from a variety of locations and underwent testing to determine the presence of produced substances that inhibit or kill one or more of several tester strains (Escherichia coli Enterococcus faecalis Staphylococcus aureus Salmonella enteritidis or Sityphimurium). Several organisms from soil samples that produce these antimicrobial substances have been isolated and our future experiments aim to include the physiological characterization of these isolates and their identification through rRNA gene sequencing.

A Large-Scale Study Characterizing the Diversity, Abundance and Depth Distribution of Deep-water Mosses in Wisconsin Lakes

Pricilla Rozario, Aedam Jeyaraj, Adam Egemo, Bethany Johnson, Brandon Sherman, Dylan White, Grey Burgess
Faculty Mentor(s): *David Lonzarich*

In lakes, mosses are distributed in deeper waters than any other form of plant life. Deep-water mosses have been documented from lakes around the world, with the earliest descriptions being reported from lakes in Wisconsin. However, because of their isolation, little is known about their ecology, especially in Wisconsin where the first record of deep-water bryophytes was reported in the early 1930s (Juday, 1934). The present study was undertaken with the primary goal of characterizing the diversity, abundance, and depth distribution of deep-water mosses from 40 lakes in northern Wisconsin. Our secondary goal was to identify water quality and physical landscape characteristics that affect patterns of distribution and diversity of these plant communities. We encountered deep-water mosses from 22 lakes, although only in a small fraction of these lakes carried moss in significant abundance. Moss diversity did not show much variability among lakes (ranging from 1 to 5 species), with the species Drepanocladus aduncus and Fontinalis antipyretica being most widespread. Based on principal components analysis, lakes with and without moss were principally distinguished by pH, alkalinity, and lake size, and to a smaller degree by water clarity and depth. Our study represents the first large scale intensive examination of the deep-water mosses of Wisconsin and is a necessary first step towards answering questions about how mosses colonize lakes, and what role they may play in their ecology.

Evaluating Sonar Technology as a Tool for the Study of Aquatic Vegetation in a Northern Wisconsin Oligotrophic Lake

Dylan White, Rebecca Rodgers
Faculty Mentor/Collaborator(s): *David Lonzarich*

Lake health is often measured through its aquatic vegetation. How many species are invasive? How diverse are the plant communities? To what depths do plants occur? Questions such as these are often answered from expensive and time-intensive field surveys but recent advances in sonar technology have opened the possibility of reducing costs and increasing the reach and frequency of lake vegetation

assessments. This study was undertaken to evaluate the accuracy of sonar surveys in Pine Lake. Since vegetation data collected by sonar technology may revolutionize the field we must be skeptical of its accuracy; but how would we know if the sonar calculations are accurate? A visual survey of aquatic vegetation is the only way to know for certain. Therefore we used underwater drones to take images of the lake bottom at 300 different sites (approximately 2 m2) at different depths each image having a unique GPS coordinate used to compare to the sonar output. Sonar and imagery surveys were conducted at the same time during the summer of 2021. This comparison allows us to determine to what extent sonar surveys accurately depict the spatial distribution and relative density of plants in the lake.

Plant Functional Trait Diversity is Influenced by Spatial Scaling and Moisture Gradients

Molly Halverson, Sydney Connor, Ethan Homann, Noah Netzinger, Julia Ratz, Madison Seim, Max Brenna, McKenna Klopfer, Greta Leicht, Ethan Smith
Faculty Mentor/Collaborator(s): *Evan Weiher*

Functional community assembly seeks to understand and explain communities in terms of mixtures of functional traits. Environmental gradients (e.g. soil moisture tree canopy composition) can affect the degree to which communities are made of similar species (trait clustering low trait diversity) or functionally different species (trait overdispersion high trait diversity). These patterns also likely depend on the spatial extent of the species pool and the spatial grain size of the sample plot. We sampled plants at 35 locations across Wisconsin each containing 3 sample plots using 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 for every plant species. We used Monte Carlo simulation to estimate the amount of functional trait diversity that would be found if community assembly was caused by random ecological drift. The simulations used four species pool scales: regional (all species) within Northern or Southern Wisconsin forests within specific forest types within each forest location. With a large-scale species pool perspective communities were made of similar species but with a small-scale perspective the pattern switched toward overdispersion. Patterns were stronger at larger grain sizes.

Spider Functional Trait Diversity is Correlated with Plant Functional Trait Diversity

Ethan Smith, Max Brenna, McKenna Klopfer, Greta Leicht, Parker Chrisler, Sydney Connor, Molly Halvorsen, Ethan Homann, Noah Netzinger, Julia Ratz, Madison Seim
Faculty Mentor/Collaborator(s): *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 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. We used Monte Carlo simulation to estimate the amount of functional trait diversity that would be found if community assembly was caused by random ecological drift. 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 the functional diversity of leaf economic traits.

Extra Sets of Chromosomes: Investigating the Effects of Polyploidy on Ciliated Neuron Structure and Function.

Dayne Kramer
Faculty Mentor/Collaborator(s): *Jamie Lyman Gingerich*

Polyploidy is a condition where organisms undergo nondisjunction events during the process of meiosis and acquire multiple sets of chromosomes. *C. elegans* are typically diploid maintaining two sets of chromosomes but have been seen reproducing stably as tetraploids with four sets of chromosomes. Regulating the expression of protein-coding genes specifically rec-8 through RNA interference affects meiotic chromosome segregation in *C. elegans* resulting in failed separation events leading to stable tetraploid worms. When this viable line of worms is made they can be identified by the associated Lon phenotype where the worms have expanded cells and longer bodies. The importance of this finding is due to the fact that many human diseases are correlated to primary cilia defects and polyploidy has been seen as a cause of the abnormalities in these cilia. Therefore the effects of polyploidy on the ciliated neurons of *C. elegans* are imperative to discoveries in human diseases as cilia serve primarily as the regulator of cellular division.

Investigating the Effects of Polyploidy on Neuron Structure in C. elegans

Kyli Blume
Faculty Mentor/Collaborator(s): *Jamie Lyman Gingerich*

Most organisms have two complete sets of chromosomes (diploidy). A few species have more than two sets of chromosomes (polyploidy). *Caenorhabditis elegans* a free-living nematode is one organism that while typically found as a diploid can actually survive and even reproduce as a polyploid organism. Complete polyploidy is lethal to mammals. However polyploid hepatocytes and cardiomyocytes have been identified although their significance remains poorly understood. Thus studying polyploidy in the easily accessible *C. elegans* can help us better understand the role of polyploidy in human health and disease.

Specifically we are interested in whether polyploidy affects ciliated neuron structure and function. To address this we first asked whether diploid and tetraploid *C. elegans* can successfully reproduce with one another. To test this a diploid male was mated with a tetraploid hermaphrodite. The male nematodes used have green fluorescent protein expressed in their neurons thus presence of fluorescent progeny indicates successful mating. If these crosses are successful we will next ask whether polyploidy affects the structure of male specific neurons by examining specific GFP localization. We report our progress in mating the polyploid strain with the diploid strain and examining the impact on neuron structure in male *C. elegans*.

Seeking Answers for Ocular Disease: Characterizing Intronic Variants of Uncertain Significance Using a Minigene System.

Caterra Leavens, Kati Sadowska, Daniel Reither
Faculty Mentor/Collaborator(s): *Jamie Lyman Gingerich, Derek Gingerich, Greg Fischer, Angela Gruber*

Exome and genome sequencing is quickly becoming standard healthcare practice for many rare diseases; however effectively interpreting genetic variants remains a challenge. Variants of uncertain significance (VUS) are frequently included on clinical sequencing reports however their clinical relevance is unclear posing a challenge for clinicians and patients seeking a molecular diagnosis. One large group of VUS are intronic variants predicted by in silico analyses to potentially affect pre-mRNA splicing. Our pilot analysis focused on 30 variants with the strongest in silico splice disruption predictions in genes associated with ocular disease. A well-characterized minigene system was used to assess the predicted splice defect (PMID: 28679633; 16925019). Briefly the minigene involves cloning a single gene segment into a plasmid vector which is then transfected into eukaryotic cells. Processed mRNA transcripts are then sequenced to determine the effects of the variant on splicing. To date we have completed transfection of all of the 30 variants. Data from these analyses have the potential to change interpretation of the VUS leading to the improvement of patient outcomes by improving the ability of physicians and scientists to determine which variants are clinically relevant improve diagnostics and increase treatment options for a variety of genetic disorders.

Soil Nutrients Do Not Impact Leaf Investment Strategies in Sunflowers Across the Upper Midwest

Michael Bylander
Faculty Mentor/Collaborator(s): *Nora Mitchell*

Climate change is impacting many organisms and ecosystems as average precipitation and temperature change across the globe. This research builds upon my team's previous research that asked how plant leaf investment strategies vary across climatic gradients using sunflower (*Helianthus*) species as a model system. Our team collected data on three species of sunflower (*H. grosseserratus H. maximiliani* and *H. giganteus*) across the Upper Midwest in the summer 2020. In 2020 we found a correlation between temperature and specific leaf area (SLA) a measure of plant investment. I was interested in the effects of soil nutrients on SLA so in the summer of 2021 I collected soil samples from the original sites. These samples were analyzed and broken down into 22 variables related to nutrients pH levels etc. These variables were analyzed against SLA and climatic data to increase our understanding of the role of soil in the study relative to climate. We found no significant evidence of relationships between any of the soil variables analyzed and SLA. This strengthens the initial finding that a shift toward more conservative leaf investment strategies may occur in areas experiencing higher average temperature under future climate change (not necessarily related to soil nutrients).

Temperature Has Greater Effect on Growth Strategies in Helianthus Than Soil Type

Thu Nguyen
Faculty Mentor/Collaborator(s): *Nora Mitchell*

Global warming is a serious ongoing problem, with rising temperatures potentially altering plants' ability to respond. Understanding how plant species adapt to these climatic changes can aid in future crop development and conservation efforts. I assessed two measures of growth response, height and specific leaf area (SLA, a proxy for plant investment strategy) on three species of sunflowers (*Helianthus giganteus, H. grosseserratus*, and *H. maximiliani*). This experiment aimed to distinguish the effects of different temperature treatment and soil types on sunflower growth strategies. SLA has been shown to be influenced by both temperature and soil type with mixed effects, while height is known to be strongly influenced by temperature. Soil type did not have significant effects on either height or SLA, despite marginally significant interactions between soil type and temperature. Increased temperature resulted in an increase in height and a decrease in SLA for two species. These findings indicate that temperature has a stronger influence on plant growth than soil type, and that these species may shift towards conservative strategies with taller shoots in the future.

Stomatal Size in Populus Trichocarpa Is Related to Climate and Exhibits Plasticity across Growing Environments

Chloe Meyer, Lauren Bangh
Faculty Mentor/Collaborator(s): *Nora Mitchell*

As climate change continues to alter environments around the world plants exhibit phenotypic plasticity that allows them to acclimate to the changing environment around them. The environment impacts plant physiology in many ways and assessing key physiological traits (such aspects of stomata leaf pores) in broadly distributed species allows for an in-depth investigation into the impacts of climate. Forty-seven unique genotypes of the species Populus trichocarpa were collected from across Canada and planted in multiple common gardens including one site in Eau Claire Wisconsin (UWEC) and a second in Fargo North Dakota (NDSU). The purpose of this experiment was to evaluate the associations between stomatal pore length and precipitation and humidity two climate characteristics that are rapidly changing. By comparing the UWEC and NDSU data we conclude that mean annual precipitation and relative humidity of the climate of origin have a significant association with stomatal pore length and that pore length also demonstrates plasticity between gardens. While these findings demonstrate that climate has a direct impact on stomatal morphology the extent to which these patterns will persist in the future remains unknown. Future research is needed to investigate how stomatal morphology will adapt to the changing climate.

Patterns of Hybridization in the Asteraceae Family Detected Through Systematic Review of the Primary Literature

Leandra O'Connell
Faculty Mentor/Collaborator(s): *Nora Mitchell*

Hybridization in plants is an evolutionary process that can be linked to speciation adaptive radiation extinction range expansion invasiveness and trait diversity. Therefore hybridization is an important ecological and evolutionary process to understand for the future of agriculture and conservation in the age of climate change. However hybridization frequency across taxonomic groups and the mechanisms behind hybridization are still largely unknown. Through an extensive data and metadata investigation into the primary literature investigating traits such as life history growth form and geographic distribution my research seeks to extrapolate patterns of hybridization in the largest flowering plant family Asteraceae. This investigation will aid in understanding the taxonomic patterns underlying hybridization in the Asteraceae family while also informing future research to support proposed mechanisms of hybridization. Thus far the primary literature has yielded 431 distinct interspecific hybrids with varying degrees of information on trait data and hybridization evidence. In terms of life history an estimated 65% of species in Asteraceae are perennial 21% annual and 14% both whereas 83% have an herbaceous growth habit and 17% are woody. These whole family values will be compared against percentages of hybrids associated with these traits to detect trait patterns taxonomically as well as to identify which traits may be related to hybridization throughout the Asteraceae family.

Incidence of Multi-Antibiotic Resistant Bacteria in Farm Soil and Manure from Wisconsin and Minnesota Farms.

Edgar Ficke-Anderson, Katherine O'Connell, Sebastian Torres
Faculty Mentor/Collaborator(s): *Sasha Showsh*

Antibiotic-resistant bacteria are becoming increasingly more common and deadly. Most of the antibiotics produced are used in the agriculture industry; particularly as feed additive to prevent disease and increase animal weight. Bacteria that become resistant to antibiotics on the farm are then spread to other environments, like water, soil and produce. When people are exposed to those environments, they can become infected by antibiotic-resistant bacteria which will then complicate successful treatment. We surveyed three different farms to determine the incidence and variety of antibiotic-resistant bacteria found on farms. We tested for resistance to erythromycin (20μg/ml), vancomycin (10μg/ml), tetracycline (20μg/ml), oxacillin (5 μg/ml), and kanamycin (20μg/ml). In our Wisconsin soil samples, we found that there were, on average, $3.93x10^{12}$ CFU/g (colony forming units per gram of soil) for vancomycin resistance, $8.0x10^{13}$ CFU/g for oxacillin resistance, $7.6x10^{9}$ CFU/g for tetracycline resistance, $1.35x10^{12}$ CFU/g for erythromycin resistance, and $4.3x10^{14}$ CFU/g for kanamycin resistance. We found that our Minnesota soil samples had an average of $2.04x10^{8}$ CFU/g for tetracycline resistance, $2.96x10^{10}$ CFU/g for kanamycin resistance, $3.24x10^{10}$ CFU/g for vancomycin resistance, $1.31x10^{10}$ CFU/g for erythromycin resistance, and $1.45x10^{10}$ CFU/g for oxacillin resistance. Manure samples were also tested for antibiotic resistance. Original antibiotic-resistant isolates were further analyzed to determine if they are resistant to more than one antibiotic. The data will be presented to demonstrate the incidence of multi-resistant bacteria isolated from farm soil and manure.

Do Atropine and Diphenhydramine Two Anti-Cholinergic Drugs Interact to Affect Daphnia Magna Heart Rate?

Savanna Bonlender
Faculty Mentor/Collaborator(s): *Tali Lee*

Pharmaceuticals are often prescribed together to treat varying symptoms so understanding how drugs interact mechanistically is important for guiding a safe and effective treatment plan. Two common drugs atropine and diphenhydramine are both classified as anti-cholinergic which means they block the action of acetylcholine resulting in an increase in heart rate. However these drugs are prescribed for different ailments so they may be administered concurrently which poses the risk for unintended side effects. The goal of this study was to investigate atropine and diphenhydramine both independently and in combination by measuring their effects on heart rate using the model organism Daphnia magna. Atropine increased heart rate by 17% compared to control while diphenhydramine increased heart rate by 27% compared to control. In combination heart rate increased by 30% which was similar in magnitude to diphenhydramine alone. In a second trial diphenhydramine increased heart rate even in the presence of a drug that reduces its ability to bind to one of its receptors suggesting its mode of action is more complicated. However because heart rate increased similarly when drugs were administered independently or in combination evidence does not suggest the two drugs interact to adversely affect heart rate.

Increased Leaf Senescence in Geranium (Pelargonium x hortorum) Cutting Propagations with Simulated Shipping Delays

Dylan White
Faculty Mentor/Collaborator(s): *Tali Lee, Kristina Beuning*

Increased supply chain disturbances and unpredictable shipping delays affect the health and profitability of floral products. Geraniums are one of the most important floriculture crops in the United States and are propagated from farms in Central and South America. After shipping stem cuttings need to be properly planted and nurtured to root develop new growth and become healthy established organisms for sale. Two-day shipping for cuttings is a widely accepted standard by horticulturists but shipping delays have uncertain effects. This research project aimed to evaluate leaf senescence (yellowing) in geranium propagations following simulated shipping delays to inform development practices in the horticulture industry. Methods were modeled after the typical protocol of an industrialized geranium stem cutting process with four test groups: 2-day (standard) and 3- 4- and 5-day (delayed) shipping periods. Leaf senescence and cutting health were measured by an assortment of evaluations including leaf chlorophyll content. Cuttings that experienced shipping delays had lower chlorophyll values than the standard with cuttings following 5-day shipping having the lowest values on day 7 post-planting. These and other results suggest that delays can significantly increase leaf senescence and reduce geranium propagation quality after just 2 additional days in shipping.

Microplastics Composition in Filamentous Algae of Lake Superior and St. Louis River Estuary

Anakah Denison, Zoe Rylander
Faculty Mentor/Collaborator(s): *Todd Wellnitz*

Microplastics (MPs) are small (< 5mm) pervasive pieces of plastic that take the form of fibers films and fragments. While the scope of their impacts in aquatic systems is not yet fully understood they have been found in the remotest parts of the world and are enmeshed in the global terrestrial and aquatic environments. In this project we aim to elucidate the composition and distribution of MPs in Lake Superior and St. Louis River Estuary (SLRE) an important ecological and economical resource for the Upper Midwest. This research is part of a collaboration with UW-Madison and UW-Superior on the source transport and impact of MPs in Western Lake Superior. A total of 30 samples of shoreline filamentous algae (*Ulothrix*) were collected from 5 sites in the SLRE and Two Harbors during summer 2021. The samples were dried ground digested with wet peroxide oxidation and vacuumed through membrane filters. Filters were examined under a dissecting microscope for microplastics which were then characterized and counted. A subsample of plastics was analyzed with Raman spectroscopy to determine chemical composition and possible source. Preliminary results showed that MPs were present in all samples and comprised 69% of particles found of which 72% were microfibers.

Treating MCF7 Human Breast Cancer Cells with Bisphenol A to Examine Effects on Inflammatory Pathways

Rachael Reesman
Faculty Mentor/Collaborator(s): *Winnifred Bryant*

This project aims to examine the effects of the environmental estrogen *bisphenol A* (BPA) on inflammatory pathways in human breast cancer cells. Environmental estrogens are found in a wide variety of plastics food and pesticides so there are human health implications for studying the link between environmental estrogens and cancer cell inflammation and growth. Environmental estrogens mimic the effects of *estradiol* (E2) as they interact with the same receptor proteins. These interactions cause growth differentiation and proliferation in their target cells. One pathway that plays a regulatory role in inflammation-associated cancer development is the Mitogen-activated Protein Kinase pathway (MAPK). The MAPK pathway is activated by chemical messengers which can include E2 or environmental stimuli. These stimuli activate regulatory proteins that mediate cell growth differentiation and proliferation. We are curious if BPA acts as an activator of the MAPK pathway specifically in cancer cells. To study this MCF7 human breast cancer cells were cultured treated with BPA and lysed. The protein content was collected quantified and analyzed using Human Cell Stress Arrays. Upon comparing cells that received BPA treatment to cells with no BPA treatment we will be able to see differences in the inflammatory response due to BPA exposure.

Improving Diagnosis of Kidney Cancer Using Infrared Spectroscopic Imaging

Blake Mathisen, Mikayla Hady, Leah Rook, Zach Caterer
Faculty Mentor/Collaborator(s): *Michael Walsh*

Infrared Spectroscopic Imaging has been shown to be a powerful approach to rapidly image human tissue biopsies to identify biochemical signatures associated with disease outcome. In this study we have applied two types of IR imaging to distinguish between two types of kidney cancer chromophobe and

oncocytoma. These two cancers represent a very difficult problem for the medical community to diagnose as the clinical symptoms are similar and they look almost identical to the experience pathologist. Definitive diagnosis between the two types is critical as the treatment options and prognosis for these two kidney cancers are very different. In this study we demonstrated that tradition IR imaging using a Fourier Transform based approach could allow for excellent objective diagnosis of these cancers. A newer faster laser-based approach which has potentially better applicability for clinical practice also demonstrated classification between the two groups. A comparison of the results between the two imaging tools will be compared and contrasted. Furthermore we will present some new results about how kidney cancer can be effected by the diabetic status of the patient.

Measuring Baseline mRNA Expression for Neuronal Marker Genes in Zebrafish Embryos Using qPCR

Emily Vanderpas, Gillian Davis, Cora Dunnum
Faculty Mentor/Collaborator(s): *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. The purpose of this project is to establish a baseline level of gene expression for a set of genes expressed in different types of neuronal cells in zebrafish. RNA has been extracted and isolated from zebrafish embryos at different developmental stages. This RNA will be converted to cDNA and then analyzed using gene-specific primers and qPCR. These results will be compared to established gene expression measurements in previous studies; we predict that the qPCR data will correlate with other reported gene expression measurements. Long-term we plan to use the expression patterns of these genes to inform experiments testing the impact of environmental and genetic factors of interest on neuronal development.

Methylene Chloride Alters Morphological Development in Zebrafish Larvae

Simon Garey, Allie Easker, Noah Titera, Carley Owens
Faculty Mentor/Collaborator(s): *Bradley Carter*

Methylene chloride is a volatile organic compound commonly used as a solvent in paints in the production of pharmaceuticals and as an extraction solvent in the food industry. In epidemiological studies environmental exposure to methylene chloride has been associated with increased Autism Spectrum Disorder (ASD) prevalence. How this chemical impacts brain formation and general embryonic development is not known. Our objectives were to (1) determine how methylene chloride can affect development in zebrafish using dose-dependent titrations and (2) identify phenotype-concentration thresholds in zebrafish larvae for morphological and behavioral analyses. In these experiments methylene chloride was emulsified with ethanol into embryo solution. Unsexed zebrafish larvae were treated with methylene chloride at 10 hours post-fertilization (hpf) with concentrations from 0 to 500 parts per million (ppm). Larvae were imaged using brightfield microscopy between 24hpf and 120hpf for several morphological features: mortality length spinal curvature eye size cardiac edema yolk edema head edema. DanioScope software (Noldus) was used to quantify these features. Methylene chloride treatment resulted in dose-dependent morphological changes in zebrafish embryos across the time course of observation. Long-term characterizing the impact of methylene chloride on brain development may contribute to improvement of understanding ASD and inform data-driven environmental regulations.

Chemistry

Biaryl Lactone Molecular Switches with Amine Donors

Courtney Westlund, Aya Abdrabbo
Faculty Mentor/Collaborator(s): *Bart Dahl*

Our research is focused on the synthesis of four bridged biphenyl molecules with amine donors. These three-state biphenyl molecules due to their chemical properties should have various uses within chemical and electronic fields. Biphenyl molecules have known dihedral angles leading to differing optical and conducting properties when manipulated. By using a lactone-bridge we can force the molecule into and out of planarity; at low pH the molecule takes a planar conformation ("ON") while at high pH it's non-planar ("OFF"). Research from previous groups has shown similar two-state molecules' effectiveness at readily switching conformations when exposed to different chemical environments. We are researching the addition of diethylamine and diphenylamine donor groups. By combining cyano and nitro acceptors used previously and differing amino donors within biphenyl molecules we can enhance optical properties and pH sensitivity. This pH sensitivity will be more precise with the addition of a third "OFF" of the molecule. At low pH the amino group should become protonated leading to the second "OFF" state and giving the molecule a narrow "ON" state. The "ON" state would result in visible color differences than the "OFF" state of the molecule. These characteristics would improve usefulness of these molecules as pH sensors.

1H-Imidazole-1-Methanol and the Progress on the Synthesis of a New Asymmetric Flexible Tridentate Pincer Ligand Featuring a Rigid Backbone

Gorana Puzovic, Keith L. Dowell
Faculty Mentor/Collaborator(s): *Deidra Gerlach*

Imidazole structures have occupied a unique position in heterocyclic chemistry as a synthetic precursor to imidazole salts ultimately for the formation of N-heterocyclic carbenes (NHCs) (Jahnke & Hahn, 2016). Nitrogen heterocyclic carbenes (NHC) were first established by Skell in the 1950s and have been additionally developed by Fischer and his students who have introduced carbenes into organic and inorganic chemistry in 1964 (Hermann & Köcher, 1997). NHCs have proven to be excellent ligands in metal-based catalysis (Enders *et al.*, 2007). The first step in the synthesis was creating 1H-imidazole-1-methanol. This compound comprises an imidazole ring with a methanol group attached at 1-position affording an imine nitrogen able to receive a hydrogen bond and an alcohol able to donate to a hydrogen bond. The crystal structure of the alcohol precursor has been submitted for publication in the peer reviewed journal *Acta Cryst E*. After a successful synthesis of 1H-imidazole-1-methanol, 1-(chloromethyl)-1H-imidazole has been obtained. Current progress toward the current synthesis of 1H-imidazole-1-methanamine will be presented.

Studying the Binding of the γ- and δ- Variants of the SARS-CoV-2 Virus to the Angiotensin Converting Enzyme 2 Receptor Using High Performance Computational Simulations

Caterra Leavens, Macey Smith, Cole Birch, Connor Dolan, Ethan Henseler, Jacob Reynolds, Marissa Snortheim
Faculty Mentor/Collaborator(s): *Sudeep Bhattacharyay, Sanchita Hati*

The COVID-19 pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected billions worldwide and as newer mutant variants are continuing to emerge the disease is still expanding to several parts of the world. The virus's main route of entry into human cells is through the angiotensin-converting enzyme-2 (ACE2) receptor using the receptor-binding domain (RBD) of the SARS-CoV-2 virus. Several of the mutations on RBD occur at the binding interface leading to the possibility of altering its binding affinity towards the ACE2 receptor. Using high-performance computing simulations we attempted to relate transmissibility to binding affinity in the gamma (g) and delta (d) variants. In the g variant of SARS-CoV-2 three mutations occur in the RBD: K417R E484K and N501K while two mutations are present in the d variant RBD: L452R and T478K. Using the simulated data the interactions at the binding interface have been studied and overall dynamics of the protein-protein complex are being assessed as a part of the research-embedded Biophysical Chemistry course. The procedures for in-silico mutations setting up of the system performing molecular dynamics simulations and results obtained from the simulated data will be presented.

Electrophilic Aromatic Substitution by Nucleophiles: Reactions of N-allyl-4-alkylamino-18-naphthalimides with Halogen-like Electrophiles

Carly Krause
Faculty Mentor/Collaborator(s): Deidra Gerlach, David Lewis

This project "Electrophilic Aromatic Substitution by Nucleophiles: Reactions of N-allyl-4-alkylamino-18-naphthalimides with Halogen-like Electrophiles" involves the study of the synthesis and reactions of our newly-discovered class of heterocyclic compounds based on an isoquinoline ring system fused with benzene (“benzo”) and oxazole (“oxazolo”) rings. Reactions with the substituted 4-amino-18-naphthalimide and molecular bromine have given observed results that show a preference for a simple addition to an alkene pi-bond in an aromatic ring which is as far as we know unprecedented. We have also found that it is unlikely that our product is formed by standard electrophilic aromatic substitution but rather the weakly-basic bromine behaves as a nucleophile to assist a formal electrophilic aromatic substitution thereafter. Our project consists of making several different N-allyl-4-alkylamino-18-naphthalimides to treat with bromine in solvent to obtain cyclized iminium ions-- ions that we can then further treat with nucleophilic species to observe their reactions and products.

When is a Bug a Feature? Enzymatic Activity in the Beer Brewing Process

Cole Birch, Caterra M. Leavens, Hunter W. Sillman, Aidan Voon
Faculty Mentor/Collaborator(s): Scott Bailey-Hartsel

The beer brewing industry has grown rapidly over the past several years. Because of this the number of hop varieties has greatly expanded making them a very valuable resource. To alleviate the financial strain a beta-galactosidase enzyme product (X-zyme) has been created with the intention to reduce the amount

of hops used in the brewing process while maintaining the levels of aroma and flavor. However in previous studies X-zyme has displayed potential esterase activity producing undesirable phenolic off-flavors (POFs). To study this esterase activity of X-zyme a spectrophotometric assay was designed using para-nitrophenyl ferulate. Detected esterase activity could indicate that X-zyme has potential off-target effects that could lead to the dumping of an entire load of beer a significant financial loss. The assay showed significant feruloyl esterase activity that may have an impact on the conditions X-zyme should and should not be used.

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

Aidan Voon, Morgan Angrove, Sofia Arisian
Faculty Mentor/Collaborator(s): *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 initiate degradation of the phytochrome red/far-red-light receptors. Plants containing mutations of both the LRB1 and 2 genes are hypersensitive 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. One of the enhancer lines is also blue-light hypersensitive and we have conducted genotype/phenotype co-segregation experiments to determine if the PHYB mutation in that line may also be responsible for the blue-light phenotype. We are also attempting to clone cDNAs encoding the mutant phytochrome B proteins from two of the enhancer lines. These cDNAs will be required for future experiments, such as generating overexpression lines that can definitively demonstrate that the PHYB mutations are responsible for the enhancer phenotype. Progress on these projects will be presented.

Analysis of the Effect of Temperature on Red Light Responses in Arabidopsis Thaliana

Emma Vega Martinez
Faculty Mentor/Collaborator(s): *Derek Gingerich*

Plant responses to red (R) and far-red (FR) light is mediated by the phytochrome (phy) pathway. Many details of this pathway are unknown including how it interacts with other environmental signals. Work by our lab and others has shown that two genes called *Light-Response BTB 1* and *2* (*LRB1 and LRB2*) regulate the phy pathway in the plant *Arabidopsis thaliana* by encoding proteins that induce phy degradation. Plants containing mutations within both genes (*lrb1 lrb2* mutants) display hypersensitivity to R. Our lab has also conducted genetic screens to identify lines ("enhancer mutants") with mutations which increase the *lrb1 lrb2* R hypersensitivity. Recent work by other groups has shown that phys also act as temperature sensors. Given this the *LRB* genes may also mediate temperature responses. We are investigating this by comparing the effects of different temperatures on R responses in *lrb1 lrb2* enhancer mutant and wild-type plants. The lines have been grown under red light at 27°C (warm) and 21°C (room) temperatures under "short-day" conditions (8 hours of light and 16 hours of darkness). Hypocotyl length in seedlings was measured as this length is a sensitive and quantitative measure of light response. Our progress and results will be presented.

Continuing Studies of the Medium Affects in Pyridine-Silicon Tetrafluoride Complexes

Becca Adams, Jacob Haar, Tate Sayre
Faculty Mentor/Collaborator(s): *James Phillips*

The project is concerned with the structural properties of pyridine-silicon tetrafluorideand its fluoro-pyridine analogs and their response to inert chemical environments. These will be accessed by quantum-chemical computations and low temperature IR spectroscopy. The initial studies obtained structure vibrational frequencies and binding energies of the pyridine-silicon tetrafluoride complex however; it is likely that medium effects may be overlooked due to thedeficiencies in chemical theory. At this point we are reinvestigating the initial results with more sophisticated levels of theory. Using silicon tetrafluoride vibrational frequencies as a reference we have identified the optimal methods for revisiting the structural results and these revised predictions will be presented. Frequency predictions will be compared to spectra conducted in the prior phases of the work to determine the extent to which solid argon and nitrogen environments impact structure. Looking forward we will be revisiting the environmental data and expanding data to trifluoro pyridine silicon tetrafluoride.

Matrix Effects on O-HX Hydrogen Bond Strength: Infrared Spectroscopy and Computations

Jacob Hahr, Becca Adams, Tate Sayre
Faculty Mentor/Collaborator(s): *James Phillips*

The group's aim is to study "matrix" effects on hydrogen bond strength. A matrix is a solid sample of noble gas or nitrogen frozen at very low temperatures. This project deals with hydrogen bonding of HCl and HBr with sp3 oxygen acceptors. These include water methanol and dimethyl ether. We investigate these complexes with infrared spectroscopy and quantum chemical computations. Infrared frequency shifts for the H-X bond correspond hydrogen bond strength as a function of methyl substitution as well as matrix host. As a result these data illustrate the effect of methyl substitution and chemical environment on hydrogen bonding in these systems. Numerous DFT methods were tested to determine which would best reproduce the high-level binding energies and experimental structure results for the H2O-HCl and H2O-HBr complexes. The binding energies for H2O-HCl CH3HO-HCl and DME-HCl are -5.5 -6.3 and -6.9 respectively. These illustrate that methyl substitution slightly increases hydrogen bond strength. The binding energy for H2O-HBr is -4.5 which is less than H2O-HCl. This implies HCl forms stronger H-X bonds than HBr. Calculations on CH3HO-HBr and DME-HBr are in progress. In addition we compared predicted HX frequency shifts in the systems to the published data for nitrogen and argon matrices. Forthcoming results from neon matrix experiments may also be discussed.

Investigating the Electrochemical Activity of Lanthanum Modified Methylobacterium Radiotolerans.

Muhaison Ibrahim, Bryce Shoberg, Moriah Weiss, Rebecca Boese
Faculty Mentor/Collaborator(s): *Krysti Knoche Gupta*

Given upsurging concerns on climate change coupled with high demands on advanced technologies electrochemists have expanded to explore the electrogenesis of bacteria. Our group explores the bio-electrocatalytic activity of Methylobacterium Radiotoloerans. M. Radiotolerans is a methylotroph that

feeds off methyl species like methanol and methane. This methylotroph produces Methanol dehydrogenase (MDH) a quinoprotein containing pyrroloquinoline quinone and La3+ at its active site and this helps in electrocatalysis.1 However this enzyme is quite deficient at freely binding to electrodes for electrocatalysis. Given this we seek to explore the potential of the bacteria as a whole to undergo electrogenesis. M. Radiotolerans will be grown in methanol media until late-log phase and cells will be harvested by ultracentrifugation. Cyclic voltamogramms and electrochemical assays will be run. This will help prove that the bacterium can generate electricity which will be useful in highly advanced technologies like biological sensors and biofuel cells.

Characterizing Recast Nafion® Film Solution Interface Diffusion and Kinetics in a Non-Aqueous System

Danielle Lehto, Anna Claire, Peter Zacher III
Faculty Mentor/Collaborator(s): *Krysti Knoche Gupta*

The effect of recast Nafion® films on platinum working electrodes in acetonitrile will be characterized by cyclic voltammetry and rotating disk voltammetry. The behavior of recast Nafion® films in acetonitrile has been observed to be different from the well studied behavior in aqueous solutions. The reversible redox couple of Tris(22′-bipyridine)ruthenium(II) hexafluorophosphate Ru(bpy)32+ in an acetonitrile electrolyte solution will be compared between a bare platinum electrode and a recast Nafion® platinum electrode by cyclic voltammetry. In cyclic voltammetry the mass transport of the species is limited to the diffusion at the stationary electrode interface. In rotating the working electrode the limitation on mass transport is extended beyond the stationary diffusion. The current is limited by the mass transport of the species to the electrode interface where it can undergo redox the limiting current of both a bare platinum electrode and of a recast Nafion® platinum electrode will be observed by varying the rotation. The diffusion interface of the electrode inside an acetonitrile solution of Ru(bpy)32+ and electrolyte will be determined by rotating disk voltammetry with both systems. The film thickness will be reported by rotating disk measurements.

Induced Chiral Mesophases from Achiral Naphthoate Derivatives in Self-Assembled Systems

Broc Kelley, Nicholas Grande
Faculty Mentor/Collaborator(s): *Kurt Wiegel*

The enhanced ordering arrangement of liquid crystals has been documented for well over a century but the relative rise in popularity of inducible mesophases has implications which reach from liquid crystalline displays to the plasmid DNA of bacteria. These mesogens existing between solid and liquid states have both ordered and disordered characteristics. These properties can be manipulated effectively through distinct temperature changes which induce self-organization of the molecules into functional structures. Such structures can be identified by their shape and their phasing. Calamitic mesogens which are the most studied types of mesogens are especially easy to identify because of their distinct smectic and nematic phases. These phases exhibit unique ordering that can be witnessed by the naked eye. Given the special nature of supramolecular organization (in which entire macromolecules reorient themselves throughout the mesogenic states) we can leverage these species under covalent conditions to lock assemblages in place. Further manipulation of the still disordered chains can allow for the control of the phase. It is in these induced chiral mesophases where there is a need for further study to better understand the implications of chain organization.

Investigation into Brain Chemistry and the Chemical Hardness of Antidepressants: Application of the Hard-Soft Acid-Base (HSAB) Theory to Aid in Antidepressant Drug Development

Macey Smith
Faculty Mentor/Collaborator(s): *Sanchita Hati, Sudeep Bhattacharyay*

Antidepressants are prescribed to countless individuals worldwide to treat depression. It is crucial to understand brain chemistry and how various parts of the brain interact with different antidepressants. In the present study using the Blugold Supercomputing Cluster quantum chemical calculations have been performed to determine the chemical hardness of the 20 common antidepressants; chemical hardness is an important chemical property that provides information about molecular reactivity and selectivity. The present study will provide an insight into the receptors within the human brain that interact with antidepressants following the Hard-Soft Acid-Base theory. The preliminary results of this computational study will be presented. The successful completion of this project could help develop new drug molecules with more specificity towards the target receptor and will have a more direct and immediate effect on patients dealing with prolonged depression.

Application of Spectroscopic Techniques to Study Molecular Crowding Effects on the Structure and Functions of Escherichia coli Prolyl-tRNA Synthetase

Miles Wackett, Christine Le, Bethany Laatsch
Faculty Mentor/Collaborator(s): *Sanchita Hati, Sudeep Bhattacharyay*

Many in vitro experiments with enzymes are performed in dilute conditions that do not resemble the cellular environment which is crowded with biomolecules. Crowding could impact an enzyme's structure intrinsic dynamics and function. To account for the crowding effect synthetic polymers are often used for simulating the intracellular environment. Previous kinetic studies demonstrated these crowders impact substrate binding and catalytic efficiency of E. coli prolyl-tRNA synthetase (Ec ProRS). However the molecular mechanism of the crowding effect is not fully understood. Therefore intrinsic tryptophan (Trp) fluorescence spectroscopy is employed to probe conformational changes of Ec ProRS in the presence of crowders. Three variants of Ec ProRS each containing TRP in only one of the three domains are purified and used to probe the conformational change of individual domains under crowding conditions. Thermal denaturation experiments were performed in the presence of monomeric and polymeric crowders to explore the impact of crowding on protein stability. Fluorescence resonance energy transfer is used to examine the changes in the domain dynamics under crowded conditions. Lastly saturation transfer differential (STD) NMR is used to observe the change in ligand binding by calculating the dissociation constant of Ec ProRS in the presence of crowders. Results of these experiments are expected to shed light on the molecular mechanism of crowing and aid in structure-based drugs design. Preliminary results of the study will be presented.

Floral Aromas and Funky Flavors an Analysis of the X-Zyme Brewing Adjunct and its Associated Enzyme Activity

Michael Brandt, Alec VandenHeuvel
Faculty Mentor/Collaborator(s): *Scott Bailey-Hartsel*

Adjuncts have been used for centuries to improve various qualities of beer. Enzyme adjuncts work by facilitating specific chemical reactions to attain results that would normally take much longer or not be possible at all without the adjunct. The X-zyme enzyme adjunct is intended to act as a beta-glucosidase and release glycosidically bound volatile terpene alcohols (VOC's) to improve aroma and flavor. When performing GCMS analysis to look for increased VOC profiles we also saw an increase in the level of 4-vinylguaiacol (4-VG). 4-VG is a "funky" clove-like off flavor in beer that is usually undesirable. It has been characterized in the brewing community as a Phenolic Off Flavor (POF) which has been shown to rely on enzymatic decarboxylation to be derived from ferulic acid. With the knowledge that 4-VG is a derivative of ferulic acid spectroscopic and HPLC ferulic acid esterase assays for in vitro and in situ X-zyme activity were developed. Both showed consistently higher ferulic acid content with X-zyme treatment. Results from our test brews suggest that there is little increase in terpene alcohols but when coupled with specific strains of yeast strains there is a large increase in the "funky" 4-VG aroma.

Exploring Molecular Crowding Effects on Proteins Using Atomic Force Microscopy and Molecular Dynamics Simulations

Alex Narkiewicz-Jodko
Faculty Mentor/Collaborator(s): *Sudeep Bhattacharyay, Sanchita Hati*

Structure-based drug design is an important tool and many pharmaceuticals are designed to target specific proteins in the body. However most protein studies (in vitro) are conducted in dilute conditions (salt-buffer solutions) which poorly mimic the environment that proteins normally operate in living cells. The inside of a cell is crowded packed with biomolecules of various shapes and sizes which could confine and change the structure and dynamics of proteins. However the precise mechanism by which the crowding and confinement impact a protein's structure and function differs from the macromolecular crowders present in the system. One of the methods to study these effects is to employ synthetic and protein-based crowders to see how they impact a protein's structure shape and function. In the present study a fusion of experimental and computational methods namely Atomic Force Microscopy (AFM) and Molecular Dynamics (MD) simulations have been used to explore the impacts of molecular crowding. The presentation will showcase some of the preliminary results of this study. By analyzing the results from these experimental and computational systems we hope to be able to gain valuable insight into how proteins operate in their natural environments and apply these data to improve protein-based drug design and distribution.

Probing the Binding Between the Receptor-Binding Domain of the Alpha Beta and Omicron Variants of SARS-CoV-2 and the Human Angiotensin-Converting Enzyme 2 Receptor Using Computer-aided Simulations

Alec Wozney
Faculty Mentor/Collaborator(s): *Sudeep Bhattacharyay*

The structure of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is characterized by its distinct spike proteins housing the receptor-binding domain (RBD). The RBD binds directly to the human extracellular peptidase domain of the receptor protein Angiotensin-Converting Enzyme 2 (ACE2) to allow the insertion of viral RNA into the cell. Mutations in the RBD have led to the emergence of new variants that affect the interactions with ACE2. The intent of this study is to assess the binding affinity between the RBD of each variant and ACE2 using molecular dynamic simulations. It can be hypothesized that these mutations alter the binding affinity between the two proteins. The variants of concern (alpha beta and omicron) were generated from the crystal structure of wild-type SARS-CoV-2. A 100 ns molecular dynamics simulation was carried out on each system and the data were analyzed to study the impact of mutations on the structure and dynamics of these protein-protein complexes. The interactions at the binding interface and overall dynamics of the protein-protein complex were investigated. Herein these computational models for the alpha beta and omicron variants are presented along with a discussion of implications on transmissibility of these variants.

Seeking Answers for Ocular Disease: Characterizing Intronic Variants of Uncertain Significance Using a Minigene System

Caterra Leavens, Kati Sadowska, Daniel Reither
Faculty Mentor/Collaborator(s): *Jamie Lyman Gingerich, Greg Fischer, Angela Gruber, Derek Gingerich*

Exome and genome sequencing is quickly becoming standard healthcare practice for many rare diseases; however effectively interpreting genetic variants remains a challenge. Variants of uncertain significance (VUS) are frequently included on clinical sequencing reports however their clinical relevance is unclear posing a challenge for clinicians and patients seeking a molecular diagnosis. One large group of VUS are intronic variants predicted by *in silico* analyses to potentially affect pre-mRNA splicing. Our pilot analysis focused on 30 variants with the strongest *in silico* splice disruption predictions in genes associated with ocular disease. A well-characterized minigene system was used to assess the predicted splice defect (PMID: 28679633; 16925019). Briefly the minigene involves cloning a single gene segment into a plasmid vector which is then transfected into eukaryotic cells. Processed mRNA transcripts are then sequenced to determine the effects of the variant on splicing. To date we have completed transfection of all of the 30 variants. Data from these analyses have the potential to change interpretation of the VUS leading to the improvement of patient outcomes by improving the ability of physicians and scientists to determine which variants are clinically relevant improve diagnostics and increase treatment options for a variety of genetic disorders.

High-Throughput Docking of Small Molecule Inhibitors of Quinone Oxidoreductase – A Toxifying Enzyme Causing Neurodegeneration in Alzheimer's Disease Patients

Levi Svaren
Faculty Mentor/Collaborator(s): *Sudeep Bhattacharyay*

N-ribosyldihydronicotinamide:quinone oxidoreductase 2 (QR2) is a cytosolic enzyme and functions to reduce quinones into hydroquinones through a flavin adenine dinucleotide -mediated two-electron reduction. QR2 can also reduce many quinone derivatives such as menadione (vitamin K3) and melatonin. However QR2 is widely known to cause cellular toxicity through the generation of reactive oxygenated species and hence elevating oxidative stress. Some recent findings indicate that QR2 is upregulated in the hippocampus of Alzheimer's disease patients. Therefore inhibitors of this enzyme have promising therapeutic value as they can fight neurodegeneration by reducing oxidative stress. The present study assesses the binding affinities of a large database that stores about millions of small molecules using "Simplified Molecular-Input Line-Entry System" or SMILES format. Using high-performance computational resources the study is aimed to obtain a faster screening of several thousand inhibitors with hopes to aid in future drug design targeting the enzyme.

Deep Docking of Small Molecule Inhibitors of Quinone Oxidoreductase – A Toxifying Enzyme Causing Neurodegeneration in Alzheimer's Disease Patients

Molly Mohr
Faculty Mentor/Collaborator(s): *Sudeep Bhattacharyay*

N-ribosyldihydronicotinamide:quinone oxidoreductase 2 (QR2) is a cytosolic enzyme that functions to reduce quinones into hydroquinones through a flavin adenine dinucleotide -mediated two-electron reduction. QR2 can also reduce other quinone derivatives such as menadione (vitamin K3) and melatonin. However QR2 is widely known to cause cellular toxicity through the generation of reactive oxygenated species and hence elevating oxidative stress. Some recent findings also suggest that QR2 is upregulated in the hippocampus of Alzheimer's disease patients. Therefore inhibitors of this enzyme have promising therapeutic value as they can fight neurodegeneration by reducing oxidative stress. The present study is aimed to assess the binding affinities of drug candidates using deep learning tools and a large cheminformatics database of small molecules. Using shell scripting the three-dimensional structures of individual molecules stored in "simplified molecular-input line-entry system" or SMILES format were extracted. By integrating deep neural network-based approaches to docking techniques a scoring system is being developed. Completion of this study will result in a faster screening of several thousands of inhibitors with hopes to aid in future drug design targeting the enzyme.

Infrared Spectroscopic Imaging: A Novel Approach to Understanding Diseases in Model Systems

Katherine Feuker, Jason Trzebiatowski, Sandra Prickett, Jocelyn Stepanik
Faculty Mentor/Collaborator(s): *Michael Walsh*

There is a critical need to be able to improve disease diagnosis and treatment of diseases such as cancer fibrotic diseases and organ transplant complications. To improve our medical assessment of diseases it is important to understand the fundamental biochemical basis of disease progression. Cell and Tissue

engineering represents a powerful approach to recapitulate diseases in model systems. Here we present recent research where we have recreated diseases to mimic the diseases of diabetic damage alcohol related disorders and fat related diseases in human cultured cell lines. It was demonstrated that using label-free spectroscopic imaging tools that we can identify biochemical alterations associated with these in-vitro models of disease. We will compare these biochemical changes to human tissues that have the same disorders in-vivo. Spectroscopic imaging coupled with cell and tissue engineering and advanced data analysis techniques permits for a better understand of disease towards improving patient outcome.

Communication and Journalism

Creating Student Centered Spaces for Multimedia Learning

Joel Kante, Sammy Wroge, Anders Aspenes
Faculty Mentor/Collaborator(s): *Ellen Mahaffy, Mary Worley*

Peer Assisted Learning (PAL) — originated in 2017 — is a student driven team with a focus to encourage other students to "Play and Learn" in a collaborative environment by implementing and expanding on their multimedia skills and creativity. Throughout our planning for the promotion and existence of these activities it became apparent that necessary changes needed to be made to the space in which those activities would occur (Oldenburg). We shifted our research focus by developing a survey to gather UWEC (University of Wisconsin Eau Claire) student input on what would make a high impact learning environment for students of the Communication and Journalism Department. The survey feedback allows us to navigate the best way to correlate secondary research regarding the Constructivism Theory (Novak) and third spaces (Oldenburg) in "community building in social spaces." Our preliminary findings suggest that updating the Communication and Journalism Center (CJC Hibbard 105-106) is a highly effective and meaningful way to give the students at the University a place to work together in a collaborative environment.

Engaging Social Media Audiences: An Investigation of Student Group Social Media

Natalie Girard, Kjerstin Carlson, Laura Schroeder
Faculty Mentor/Collaborator(s): *Kristine Knutson*

Participation in student organizations is an important way to prevent student attrition on college campuses. During the COVID-19 pandemic student participation in on-campus activities and organizations dropped significantly with distance and online learning. Professionals in campus activities are searching for ways to invigorate students' excitement over participating in and leading on-campus organizations (Peck et. al 2020). One way students can attract others to their organizations is through social media but many student content creators have no formal instruction in best practices. Through the use of focus group interviews this study seeks to identify the social media strategies university students deem effective as well as how students perceive social media messages from student groups. During focus groups participants will be asked to react to a series of social media posts created by campus student groups. Students will then be asked to scroll through their social media and share examples of engaging content. Transcripts and notes from these sessions will be analyzed using thematic analysis techniques. Emergent themes will be compared to industry best practices and a guide for student organization content

creators will be developed. It is expected that participants will perceive messages that utilize industry best practices as most effective.

An Examination of the Neurodiversity Paradigm and School Professionals' Communication with IEP Teams Families and Disabled Individuals

Courtney Claeys, Anna Loughridge, Mikayla Soltis, Emily Zwiefelhofer
Faculty Mentor/Collaborator(s): *Kristine Knutson*

The neurodiversity paradigm argues that neurodiversity (i.e.the idea that human brains operate in a variety of different ways) is valuable and that a variety of ways of being ought to be considered "normal." Neurodiverse individuals include those with autism ADHD dyslexia mental health challenges etc. The National Center for Education Statistics (2021) indicates that 14% of students in the United States receive special education services many of whom receive services because of those neurodivergent conditions. Utilizing a mixed-method design this study seeks to learn how beliefs about neurodiversity affect Individualized Education Plan (IEP) team members' interactions with special education students and members of the IEP team. Education professionals in the local community (e.g. general and special education teachers SLPs OTs PTs BCBAs School Psychologists etc.) will be surveyed concerning their beliefs about neurodiversity as well as communication behaviors. At the end of the survey participants will be invited to participate in an interview to further understand how professionals' views about neurodiversity affect the ways they communicate with individuals on the IEP team. We expect to find that education professionals have biases that influence their interactions with students.

Beliefs about Neurodiversity: A Comparison of Student and Professional Viewpoints

Courtney Claeys, Anna Loughridge, Mikayla Soltis, Emily Zwiefelhofer
Faculty Mentor/Collaborator(s): *Kristine Knutson*

The neurodiversity paradigm argues that neurodiversity (i.e.the idea that human brains operate in a variety of different ways) is valuable and that a variety of ways of being ought to be considered "normal." Neurodiverse individuals include those with autism ADHD dyslexia mental health challenges etc. The National Center for Education Statistics (2021) indicates that 14% of students in the United States receive special education services; services provided by education professionals such as Special Education Teachers Speech Language Pathologists (SLPs) Occupational Therapists (OTs) Physical Therapists (PTs) Board Certified Behavior Analysts (BCBAs) School Psychologists etc. This study seeks to understand if and how views about neurodiversity differ between students studying to become educational professionals and those already working in the field. Using a survey methodology participants' beliefs about neurodiversity and utilization of collaborative communication practices will be measured. An analysis of variance (ANOVA) will be conducted to see if differences in study variable means exist between students and early mid and late career professionals. We expect that students and early career professionals will have more positive beliefs about neurodiversity than mid and late career professionals and that all groups of professionals will indicate a preference for higher levels of collaboration.

Understanding the Value of the Communication Field: Perspectives from Communication Majors

Kaitlin Hayes, Claire Karges, Meghan Yakel, Mia Gregory, Sam Bloch, Blake Durham

Faculty Mentor/Collaborator(s): *Kristine Knutson*

Annually the National Association of Colleges and Employers (NACE; 2021) releases a list of attributes that employers seek on candidates' resumes. Frequently many of the top ten skills are skills taught within university-level communication courses (i.e. ability to work in a team problem solving skills analytical skills verbal communication skills written communication skills and leadership skills). This means communication majors should leave their university experience well-positioned to contribute to a variety of organizations. Nonetheless communication is often portrayed as "easy" or "non-rigorous." To better understand how communication majors think others perceive their field as well as how communication majors talk about the importance of communication in the world communication majors will be interviewed to better understand their perspectives on the field. We believe that communication majors will be able to speak to a variety of positive and negative reactions to their major. Additionally we think communication majors will be able to speak clearly and convincingly about the importance of communication in a wide variety of contexts.

Understanding the Value of the Communication Field: Perspectives from Communication Non-Majors

Kaitlin Hayes, Sam Bloch, Blake Durham, Claire Karges, Mia Gregory, Meghan Yakel

Faculty Mentor/Collaborator(s): *Kristine Knutson*

Annually the National Association of Colleges and Employers (NACE; 2021) releases a list of attributes that employers seek on candidates' resumes. Frequently many of the top ten skills are skills taught within university-level communication courses (i.e. ability to work in a team problem solving skills analytical skills verbal communication skills written communication skills and leadership skills). While business professionals see the value in communication skills often the communication field is portrayed as "easy" or "non-rigorous." To better understand how university students perceive the communication field and how they talk about the importance of communication in the world we will survey university students about their perceptions of a variety of university majors. We believe that university students will perceive STEM (Science Technology Engineering Math) majors as more valuable than communication majors but that students will also indicate the value of strong communication skills in their organizational and interpersonal lives.

"Don't Look at My Eyes" - Foster Care: A Look into the Communication Patterns in Foster Family Units

Elianna Zimmerman

Faculty Mentor/Collaborator(s): *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 and the family communication patterns theory aids in exploring this communication. 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. There are various systems in which foster families exist. This study aims to analyze the communication patterns between the key members of the foster care system. How do parents and children interact? How do foster parents communicate with members outside their home 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 aim to learn how foster parents can better communicate about their foster children and with their foster children.

A Comparative Analysis of American and Chinese News Media Coverage of Climate Change Issues over 2021

Natalie Girard
Faculty Mentor/Collaborator(s): *Won Jang*

This research offers an empirical analysis comparing Chinese and U.S. news agencies coverage of Climate Change in 2021. As Climate Change negotiations become more of a consistent and pressing issue it is important for us to study the world's top two greenhouse gas emitters China and the U.S and the roles they play in global negotiations. With international news agencies holding strong influence on global community's perspectives and resolution of general knowledge we examined the presentation of news agencies between the two countries and whether the depositions of the topic were similar. Comparatively we argued that if not similar the conflicting views would result in differences between presiding principles and the dominant interests of each individual news agency's home nation. Our research showed that both agencies published varying amounts of news coverage that stemmed from multiple sources. It was also noted that there were differences between Chinese framing of climate change and the U.S. framing. We can contribute these differences to how the influence of the differing governments propaganda reports on this topic in each country.

Communication Sciences and Disorders

The Power of Conversation: Fostering Cultural Awareness in Communication Sciences and Disorders

Samantha Ruppert, Paige Marsh
Faculty Mentor/Collaborator(s): *Abby Hemmerich*

In the field of Communication Sciences and Disorders (CSD) professionals strive to be responsive to the cultural variation of the clients and families they serve. This project aims to improve cultural awareness in the field of Communication Sciences and Disorders by having UW-Eau Claire students participate in a cultural immersion event. The event we are creating is based on "The Human Library" a concept started in Denmark with the goal of confronting prejudices and connecting participants with those they may not encounter on a regular basis. While research focused on similar events has taken place in disciplines such as Social Work education the use of this in Communication Sciences and Disorders education is yet to be explored. Senior CSD students will reflect on their cultural responsiveness and awareness after completing conversational sessions with students from various campus cultural organizations. Following

the conversational event the students will complete a rating scale based on ASHA's Cultural Competence Self-Reflection Checklist as well as open-ended questions for reflection. The survey responses will be analyzed using quantitative and qualitative methods. Participants' change in understanding of cultural awareness concepts when compared to their awareness before the event will be presented.

Text vs. Video Feedback in an Asynchronous Discussion Forum

Nicole Weiss, Rachel Meyer
Faculty Mentor(s): Abby Hemmerich, Thomas Sather

As online learning has become more prevalent in education in the wake of COVID-19, students have reported feeling isolated and less engaged in learning. While it is well known that social interaction is a critical component of successful learning environments, there is much to be learned about how to create that social interaction in an online classroom, particularly related to interactions between students and instructors. The purpose of this study was to gain student perspectives on instructor feedback provided via text versus video format. Students in an online, asynchronous course participated in online discussion forums. Student teams were counterbalanced to experience two units with video feedback and two units with text feedback from the instructor. After exposure to both types of feedback, student perspectives were collected via a survey in which a Community of Inquiry framework was embedded. Results showed students preferred video feedback for the cognitive, social, and teaching aspects of Community of Inquiry. However, the students' overall preference did not discriminate clearly between video or a combination of video and text, as accessibility of text-based feedback was a factor.

Interprofessional Education Experience between Physical Therapists Occupational Therapists and Speech-Language Pathologists

Hannah Boyles, Brooke Wiles
Faculty Mentor/Collaborator(s): *Abby Hemmerich*

Speech-language pathologists often collaborate with professionals of many different disciplines within the health care and educational field which is considered interprofessional practice. Interprofessional education is two or more disciplines learning together effectively to achieve a set goal of providing patients with the highest quality care. The purpose of this study was to examine the similarities and differences between students in Physical Therapy Occupational Therapy and Speech-Language Pathology fields while collaborating in an interdisciplinary simulated evaluation of a stroke patient. Graduate student participants completed a self-efficacy survey before and after the simulated evaluation to identify changes related to their confidence in implementing interprofessional services. Additionally students completed a reflection related to the experience. Quantitative analysis of survey data and qualitative analysis of student reflections will be shared. Student reflections have indicated a positive experience of the simulated evaluation across disciplines. Student perceptions related to collaboration and common themes across multiple disciplines in both the survey and reflections will be presented.

Structure Meeting Agenda: Does It Improve Outcomes and Experiences of the Instructional Internship Program?

Meggan Lind, Yi-Shen Tham
Faculty Mentor(s): Brian Orr, Jerry Hoepner

The purpose of this study is to determine the effectiveness and potential benefits of utilizing a structured meeting agenda to guide weekly instructional team meetings between faculty instructors and student instructional interns (II). Previous research related to our Communication Sciences and Disorders (CSD) departmental instructional internship program has yielded helpful and actionable findings about II outcomes; however, there has not yet been a systematic investigation into optimal formats for weekly instructional team meetings. Subsequently, different instructors have different approaches and expectations for II performance and meeting structure. A structured meeting agenda was developed based on pilot study findings from the Fall 2021 semester. The structured agenda was implemented across all CSD faculty with IIs in the Spring of 2022 semester. Post-semester (late April) written interviews were conducted across all faculty members, regarding implementation and outcomes of the structured agenda approach. Qualitative analysis of written interviews using thematic analysis and interpretive description (Thorne, 2016) techniques will be used to characterize the experiences with the structured meeting agenda of both instructors and instructional interns.

COVID-19 Impacts on Children's Home Literacy Experiences

Maggie Prokosch
Faculty Mentor/Collaborator(s): *Brian Orr*

Children’s home literacy experiences have lasting impacts on their reading and academic achievement. Children from families thatestablish and prioritize a ‘culture of reading’ in the home arrive at formal schooling with a distinct advantage over those with lessexposure to text in skills related to reading acquisition and academic development (Yeager Justice Pentimonti & Schmitt 2016).Critically performance gaps present at the start of formal schooling typically remain stable over time. This means that children withlimited home literacy experiences frequently begin schooling behind their peers and struggle to close the achievement gap.Maintaining a culture of reading in the home depends on established routines and practices that revolve around books. Regrettablythe onset of COVID-19 (coronavirus) ushered in significant disruptions to daily life in the United States that jeopardized the stability ofthose crucial home literacy routines. For example emerging research has found that families report engaging in significantly fewerroutines as a consequence of the pandemic (Bates Nicholson Rea Hagy & Bohnert 2021). Impacted routines include thoseassociated with a positive home literacy environment (e.g. bedtime routines or limitations on screen time) (Yeager JusticePentimonti & Schmitt 2016) and access to community resources such as libraries (Prime et al. 2020).It is unclear how these disruptions of family routines have impacted the nature frequency and stability of practices found to beintegral to maintaining a culture of reading in the home. It is also unknown if family experiences during the pandemic have changedparent’s or caregiver’s own attitudes and practices related to reading both of which are additional factors in a quality home literacyenvironment (Buvaneswari & Padakannaya 2017). The purpose of the proposed study is to identify and describe the direct impacts ofthe COVID-19 pandemic on the family routines and practices related to the establishment and maintenance of a positive home literacyenvironment. Buvaneswari B. & Padakannaya P. (2017). Development of a home literacy environment questionnaire for Tamil-speakingKindergarten Children. Language Testing in Asia 7(1). https://doi.org/10.1186/s40468-017-0047-y Bates CR Nicholson LM Rea EM Hagy HA Bohnert AM.

Life Interrupted: Family Routines Buffer Stress during the COVID-19Pandemic. J Child Fam Stud. 2021;30(11):2641-2651. doi: 10.1007/s10826-021-02063-6. Epub 2021 Aug 13. PMID: 34404970;PMCID: PMC8360776.Prime H. Wade M. & Browne D. T. (2020). Risk and resilience in family well-being during the COVID-19 pandemic. AmericanPsychologist 75(5) 631–643.

Students React to the Experience of Pseudostuttering: An Analysis of a Stuttering Simulation Assignment

Annika Kornmann
Faculty Mentor/Collaborator(s): *Bryan Brown*

Simulated stuttering is a common educational practice in fluency disorder courses at both the undergraduate and graduate level however some have questioned the usefulness of this assignment. This retrospective study investigated whether pseudostuttering as an assignment is beneficial to future clinicians using a qualitative analysis. Undergraduate students enrolled in one of two fluency disorders courses (N=70) participated in this study and were assigned to interact with strangers by either stuttering on purpose or avoiding a particular sound or word. After the experience they wrote reflections based on their experiences. These reflections were analyzed using a phenomenological qualitative approach to identify major themes and subthemes related to the experience of changing their speech in conversations with unknown communication partners. A previous portion of this study presented student stigma toward stuttering and clinical implications learned from this assignment. Student reactions will be integrated with previous data of stigma toward stuttering and clinical implications. Outcomes include varying results to the benefit of this assignment and suggestions for future research related to pseudostuttering assignments.

Exploring Motivational Interviewing as a Resource in Parent-Clinician Collaboration on a Conversation Intervention

Marissa Niehoff, MiKayla Schuebel
Faculty Mentor/Collaborator(s): *Charlotte Clark*

The aim of this study is to explore the potential of motivational interviewing (MI) techniques as a way of fostering collaboration between parents and clinicians of diverse backgrounds. MI is a counseling style that prioritizes parent values and beliefs in order to develop intervention goals. One place where it is important to be sensitive to values and beliefs is during language intervention. Reminiscing conversations are increasingly included as a part of intervention. However reminiscing styles vary depending on culture so it is important to make sure that cultures are respected when supporting parents in reminiscing. Our project will review the existing literature related to the use of motivational interviewing with parents and the literature examining parent-child reminiscing across cultures with the intention of designing a qualitative study that examines the potential of MI as a tool that fosters greater cultural sensitivity.

Repetition and Repair Strategies within Reminiscing Conversations between Parents and Children with Language Disorders

Maura Kitto, Emily Stover
Faculty Mentor/Collaborator(s): *Charlotte Clark*

When a parent helps a child reminisce it can benefit the child's social and self understanding language and literacy as well as the quality of the parent-child relationship. Parents can use either elaborative or

repetitive styles during reminiscing conversations with their child. Elaborative parents expand on utterances providing more information and asking more in-depth questions when looking for a response from the child. Repetitive parents tend to repeat the same question without embellishment.In this study we examine how parent repetitions function within the reminiscing conversations of parents and children with language disorders. Our aim is to expand the existing research regarding conversational strategies and parent styles of reminiscing to include examples of parents and children with language disorders. By examining transcripts of parent-child reminiscing conversations we provide insight into the different functions that repetitions serve within these conversations. Qualitative methods of analysis are used to describe the different functions of repetitive utterances that emerged from the data. Within this project we expect to see that repetitions will serve multiple functions and that they will be most effective in repairing communication breakdowns when combined with other conversational strategies. Such insights will have important clinical implications for language intervention.

Examining a Project-Based Intervention for an Individual with a Severe Traumatic Brain Injury

Libby Macken, James Landherr
Faculty Mentor/Collaborator(s): *Jerry Hoepner*

Our research project employed a single-subject design to examine a project-based intervention for an individual with a severe traumatic brain injury. The academic literature on project-based intervention focuses mainly on group-based intervention but not on a single-subject design (Behn et al. 2019; Feeney & Capo 2010 Hoepner et al. 2022). Our project will provide a template for future clinicians to use when conducting a single-subject design for a project-based intervention for a client with a brain injury. The participant was a client at the Center for Communication Disorders which is covered by a blanket institutional review board protocol. The project contained two context-sensitive activities and correlated with the participant's job description and goals. The participant used a goal attainment scale to self-assess progress towards targeted treatment areas in an objective method. In addition to baseline the participant completed a goal attainment scale recall four subsequent trials. The participant showed clinically significant improvement in 2/4 goals and also had verbal statements of the impact the therapy had on his life. Field notes were used to corroborate progress related to the participant's project work.

Fostering Language Development in Young Children

Haley Poeschel, Ally Hinkens
Faculty Mentor/Collaborator(s): *Lesley Mayne*

The purpose of this research study was to evaluate the learning outcomes of Head Start teachers' staff and administrators' perceptions of confidence in general areas impacting communication for young children access to communication resources for young children and knowledge and implementation of language strategies. This project provided insight into the importance of identifying and preventing language delays for children ages 3-5 through an in-service training for Head Start teachers. This project determined the effectiveness of an in-service presentation on participants' perceptions of the learning outcomes. Participants accessed a QR code to participate in a Qualtrics pre- and post-survey. Participants responded to several questions regarding their initial perceptions of knowledge resources and strategies to support communication. Following the pre-survey participants engaged in and listened to a presentation called Fostering Language Development in Young Children. They then responded to the same questions in a post-survey along with three qualitative questions focused on learning outcomes application to practice

and information they want to know more about at a future training. The data collected was used to evaluate the effectiveness of the in-service training for Head-Start staff members. The quantitative and qualitative findings will be discussed during the presentation.

Mapping WHO-ICF Domains to Student-Identified Twitter Content in an Online Aphasia Course

Anna Bujak, Faith Tullar
Faculty Mentor/Collaborator(s): *Thomas Sather, Lesley Mayne*

This project investigates how Twitter posts identified by graduate students in an online graduate aphasia course reflect components of the World Health Organization's International Classification of Functioning and Disability (WHO-ICF) model. Twitter may be an effective pedagogical strategy to support learning within and outside the classroom. It provides students opportunities to explore course-based information in other mediums and engage in discussions with other students and professionals across this social media platform. As part of the course-based assignments students posted Twitter relics quarterly to discussion boards within Canvas. Qualitative data was collected through a coding process connecting the posted Twitter relic to the course learning outcomes. The course learning outcomes and Twitter relics were coded onto the WHO-ICF model components therefore connecting the main idea from each Twitter relic to specific WHO-ICF model components. Results indicate five of the 13 learning outcomes were represented by 69% of the Twitter relics and that students' relics favored two of the four learning components of the WHO-ICF model. This disproportionate distribution across course outcomes and WHO-ICF components may indicate instructor's values and may support Twitter as a pedagogical tool to support course-learning objectives and components of the WHO-ICF.

Computer Science

Understanding the Language of Music : From an Etude Generation Perspective

Lauren Casey, Joe Taylor, Jared Jones
Faculty Mentor/Collaborator(s): *Benjamin Fine*

Understanding the Language of Music: from an Etude Generation Perspective In recent years there has been a focus on the accessibility and equity of music instruction in underserved communities. The value of private/guided instruction is clear, but the question of reaching students from lower economic classes presents challenges our current educational system struggles to address. This project will provide students with a system that ultimately improves their practice environment and material. The Bluegold Computational Music Suite is a system that supports novice to intermediate musicians in their musical goals by giving them access to computer generated lessons that mimic what a private instructor would assign to them. This work investigates methods for automatically generating musical etudes that are derived from a given musical selection. We compare various methods implemented from the current literature by quantifying the similarities between the generated music and the original selection. Using the similarity results, we make recommendations for which methods should be considered when generating etudes for musical instruction.

Classification of Independent Medical Examination Reports Using Supervised Learning Methods

Cole Pearson
Faculty Mentor/Collaborator(s): *Jim Seliya*

An independent medical examination (IME) is requested by an insurance provider or self-insured employer to determine the extent of an injured worker's disability, including if the injury or ailment is permanent or non-permanent. An IME report is the summary document providing a physician's medical opinion about a patient based on their experience. This research builds upon previous work using IME reports provided by an orthopedic surgeon from a private practice in the United States, and our aim is to classify de-identified IME reports as fitting one of two categories: Permanent and Not Permanent injury. We apply Naive Bayes (NB) and Support Vector Machine (SVM) classifiers to this task and consider various hyperparameter combinations for each. We compare precision, recall, and f-measure for each model across 300 randomly selected reports from the larger dataset and discuss trends in the performance data. Results for NB classifiers show difficulty in achieving high f-measure (above 0.55) while both precision and recall above 0.9 can be selected for at the expense of the other. Initial results using SVM classifiers suggest a similar trade-off will be present. We suggest these shortcomings may be attributable to our small sample size, which will be addressed in future work.

Curiosity Detection in Student Text Responses

Mitchell Hanson
Faculty Mentor/Collaborator(s): *Jim Seliya*

A data mining and machine learning approach to curiosity detection in text data is a relatively novel concept. Learning how to learnand applying new knowledge are vital skill students need to develop. A student's curiosity in exploring a topic supports learning thatknowledge, building upon what is taught in their academic program. Curiosity supports lifelong learning, one of the most desirableoutcomes of higher education, by its role as an intrinsic reward. The key elements of the project involve data collection based on theQuestion Formulation Technique, feature selection of the words with high correlation to students' degree of curiosity, classificationmodeling and analysis of propensity for exploration as a metric for students' degree of curiosity, and Nominator(s)ing two students in novelresearch related activities.

Machine Learning Based Approach to Recommend MITRE ATT&CK Framework for Software Requirements and Design Specifications

Ben Hallis, Nicholas Lasky
Faculty Mentor/Collaborator(s): *Mounika Vanamala*

Engineering more secure software has become a critical challenge in secure cyberspace. It is very important to develop methodologies, techniques, and tools for developing secure software. To develop secure software, software developers need to think like an attacker through mining software repositories. These aim to analyze and understand the data repositories related to software development. The main goal is to use these software repositories to support the decision-making process of software development. There are different vulnerability databases like Common Weakness Enumeration (CWE), Common Vulnerabilities and Exposures database (CVE), and CAPEC. We utilized a database called MITRE. MITRE ATT&CK tactics and techniques have been used in various ways and methods, but tools for

utilizing these tactics and techniques in the early stages of the Software Development Life Cycle (SDLC) are lacking. We propose to develop a recommender system that recommends tactics and techniques relevant to the system under development based on software requirements and design documents. Software developers can develop security requirements and secure designs based on these attack patterns.In this project, we use machine learning techniques for retrieving MITRE tactics and techniques to a system under development based on the Software Requirements Specification (SRS) document and use cases.

Uses of Machine and Deep Learning in the Identification of Machine-Generated Texts

Mitchell Haley
Faculty Mentor/Collaborator(s): *Mounika Vanamala*

Machine-generated texts are becoming increasingly difficult to distinguish from texts created by humans. Potential malicious use for these texts is the dissemination of misinformation. The use of natural language processing models allows for the generation of large amounts of unique text from a short prompt. These methods could assist malicious actors in generating texts which could be presented as factual information. However, it was entirely composed by a machine looking at nothing other than a prompt. The rise of these machine-generated texts calls attention to the need to distinguish between texts created by humans and machines. In this research project, I review the presently available machine and deep learning methods to discover which can most effectively determine the origins of a text.

A Comprehensive Review of Artificial Intelligence Used to Combat COVID-19

Jordan Langlois, Connor Kamrowski, Matthew Martinez, Ian Dircks, Keegan Grottodden, Mitchell Haley
Faculty Mentor/Collaborator(s): *Rahul Gomes*

The Coronavirus disease (COVID-19) has had a significant impact on global health since the start of the pandemic in 2019. Over 422 million people have been infected globally and 5.8 million have died as a result of the disease. Artificial Intelligence solutions such as machine learning and deep learning have played a major part in this pandemic for the diagnosis and treatment of the COVID-19. In this research, we review these modern tools deployed to solve a variety of complex problems. We explore research that focused on analyzing medical images using AI models for identification, classification, and tissue segmentation of the disease. We also explore prognostic models that were developed to predict health outcomes and optimize allocation of scarce medical resources. Longitudinal studies were conducted to better understand COVID-19 and its effects on patients over a period of time. Finally, focus on contact tracing technology is also explored to analyze geographical and managerial efforts taken to combat this pandemic. This comprehensive review of the different AI methods and modeling efforts will shed light onto the role that AI has played and what path it intends to take in the fight against COVID-19.

A Deep Learning Model for Pancreatic Ductal Adenocarcinoma Chemotherapy Outcome Prediction

Nichol He, Connor Kamrowski, Jordan Allen
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Pancreatic Ductal Adenocarcinoma (PDAC) is an aggressive abdominal malignancy, with an overall 8.5% 5-year survival rate. PDAC is often detected too late for surgical resection and associated with resistance to chemotherapy and radiation. Morphological characteristics of PDAC tumors can be extracted from CT scans and are associated with tumor characteristics and behavior. In this research, a deep-learning system for predicting chemotherapy outcome based on CT scans is being explored. To establish the foundation for this system, a comparative analysis between 2D-UNet and 3D-UNet has been performed. Experiments reveal 2D-UNet model to have higher accuracy in pancreas segmentation. To increase prediction accuracy, the effects of novel data augmentation techniques, including window level and cropping, have been utilized. By establishing techniques for standardizing CT scans from different datasets and using a flexible segmentation model, we aim to create a pipeline for pancreas segmentation followed by tumor extraction and staging using texture analysis.

Comparison of Pathways and Detection Strategies for Pancreatic Ductal Adenocarcinoma (PDAC) using Genetically Engineered Mouse Model (GEMM)

Ashleigh Kroschel, Olivia Heinecke
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Pancreatic ductal adenocarcinoma (PDAC) is a deadly, invasive pancreatic cancer. Currently, there are five central models used to investigate PDAC, namely, human PDAC cell line, cell line xenograft, patient derived xenograft, genetically engineered mouse models (GEMMs), and organoids. Cell lines don't represent the heterogeneous nature of PDAC nor the pressures of the human immune system making them less relevant than other models. Xenografts have a low engraftment rate making the number of models available exceedingly small, and organoids are still in development and analysis phase. In this research, we focus on exploring GEMMs, the most useful in biomarker discovery and specific gene mutations. Using these GEMMs, an in-silico model will be developed for simulating PDAC. Steps would include, developing a model, genetically modifying it, and predicting how often PDAC develops in the model to understand the importance of that gene in PDAC progression. Preliminary research revealed several detection strategies like PanIns, CA 19-9, stromal-related circulating molecules, biomarkers, and mitochondrial DNA. Some gene activity or pathways to explore may include COX-2, Notch pathways, MMP-7 expression, and MAPK pathway.

Deep Learning Segmentation of Kidney Tissue Microarrays using Infrared Spectral Imaging

Connor McKeown, Jordan Langlois, Zach Caterer
Faculty Mentor/Collaborator(s)*: Rahul Gomes*

Renal function is an essential marker in the classification of renal disease and clinical symptoms of renal failure develop when there is 15% renal function. In this study, we used infrared spectroscopic (IR) imaging to investigate biomolecular markers from renal transplant biopsies. These images are used for the classification of regions of fibrosis from biopsies containing renal cell carcinoma (chromophobe and

oncocytoma) and the prediction of fibrotic proliferation using biochemical signatures. IR spectroscopy is a diagnostic approach utilizing human tissue to label biochemical signatures. Images are captured in several hundred wavelengths in the infrared region of the electromagnetic giving researchers access to more information than traditional RGB images captured by a microscope. While images captured in several bands are great for disease diagnosis, it poses significant challenges for manual cell review by a pathologist. To address this issue, a fully automated pipeline for image processing is being explored. Preliminary research involves using Principal Component Analysis which returns the significant spectral bands necessary for detecting regions of fibrosis. After this feature selection step, a deep learning model called UNet will be applied for the segmentation and identification of fibrosis.

Detection of Inferior Vena Cava Filters on CT Scans using an Artificial Intelligence Algorithm

Connor Kamrowski, Pavithra Devy Mohan, Cameron Senor
Faculty Mentor/Collaborator(s): *Rahul Gomes*

Inferior vena cava filters (IVCF) are placed to keep blood clots from travelling up to the heart, and they are designed to be removed. However, it is very common that IVCF retrieval doesn't occur, which puts the patient at risk of potential complications. This research aims to propose an automated deep learning algorithm which can detect IVCF from CT scans and alert healthcare professionals. A deidentified CT dataset was used from Mayo Clinic containing 90 scans with IVCF and 90 normal scans. Scans were obtained from radiology report texts and manually verified. Data preprocessing includes a 40cm crop from the lung bases, a uniform resizing to a resolution of 128x128x64, and an intensity crop to a range of 1 to 2500 Hounsfield units. Data augmentation was utilized to increase model prediction accuracy and reduce overfitting before scans were fed to the model. The model used for classification was a 3D UNet. The model had six convolutional layers utilizing different filters to extract relevant information from the scans such as texture, shape, and contrast. The model utilized 144 images for training, and 36 for validation. A training accuracy of 97.3% and validation accuracy of 94.44% was achieved.

An Overview of Colorectal Cancer Detection and Prevention using Machine Learning Techniques

Elena Bourget, Oliver Mahan, Emily Fenno
Faculty Mentor/Collaborator(s): *Rakib Islam*

The idea of using machine learning techniques to identify colorectal cancer is a relatively new one, with most of the research being done in the last ten years. To determine the current state of research in this field, an analysis of a large number of research articles from Web of Science was performed. We aim to provide a comprehensive summary of the current state of colorectal cancer identification and prevention in order to understand the trend of research topics in the research domain. We do this through bibliographic analysis using Vosviewer, an automated visualization tool, on a variety of parameters. Our study will provide a foundation on which future research in the field of colorectal cancer detection and prevention using machine learning can be conducted.

Using Machine Learning to Analyze and Classify Echocardiogram Results

Samantha Meznarich
Faculty Mentor/Collaborator(s): *Rakib Islam*

Heart arrhythmias can be difficult to diagnosis simply from external observation, and many fail to present themselves through concerning symptoms until damage has been done to the heart and the rest of the body. One of the most common tools used to identify these problems is an electrocardiogram (ECG) test, which records impulses from the patient's heart (heartbeats) and can reflect the state of the individual's cardiovascular system. ECG test outputs are labored over by cardiologists, which can be time consuming and subject to misinterpretation. An efficient and accurate analysis of an ECG test is critical, as early detection—particularly with more serious arrhythmias—is extremely influential in treatment success. This research explores the potential of using machine learning algorithms to read and analyze echocardiograms based on a number of input factors. Using a computer algorithm can reduce the amount of time cardiologists spend analyzing and understanding the output of an ECG, while also potentially improving accuracy. This poster details the machine learning algorithms used in the diagnosis, as well as their individual performances.

A Comparative Study of Name Entity Recognition Techniques in Software Engineering Texts

Yi Jian Cheng, Oliver Mahan
Faculty Mentor/Collaborator(s): *Rakib Islam*

Named Entity Recognition (NER) is an essential sub-task for many important tasks in software engineering (SE), such as automated requirement analysis, opinion mining, question answering, knowledge base construction, and information retrieval. As existing domain-independent NER approaches perform low when applied in the SE domain, we observe the development of different tools and techniques for NER in this domain recently. Despite those developments, we lack our understanding of the effectiveness of the deep learning based state-of-the-art models and existing popular machine learning based tools for NER in SE texts. Thus, in this study, we quantitatively evaluate the performances of seven versions of machine learning and deep learning based tools and techniques in detecting name entities from SE texts. This study will advance our understanding on the effectiveness of the NER techniques in the SE domain.

A Comparative Study of Source Code Change Pattern Detection Tools

Nick Moore, Somin Lee
Faculty Mentor/Collaborator(s): *Rakib Islam*

Analyzing and understanding source code changes is important in a variety of software maintenance tasks, such as automated program repair. Although many code differencing and code change summarization methods have been developed, the accuracies of those tools were never compared against each other. Thus, their comparative performances remain unknown.In this study, we have selected two recently developed tools and applied those in a large buggy source code dataset. Then, we have quantitatively and qualitatively evaluated their performances in detecting patterns in changed source code. Our study findings will help other researchers and software developers to choose the appropriate tool for relevant tasks.

Applications of Computer Science in the Field of Psychology

Kyle Sargeant
Faculty Mentor/Collaborator(s): *Rushit Dave*

The field of Psychology and the field of medicine and medical care are often viewed as very different. One of the main differences between these two fields is the application of prediction. When it comes to physical health, the medical field can predict outcomes of an individual's health based on things like diet, exercise, and genetic makeup. Psychology is a little bit different. Psychologists are great at predicting behavioral changes in patients, but the prediction of an individual's mental health is not up to par with the prediction of physical health in the medical field. The scope of this study is to highlight how machine learning has been applied to Psychology, in particular how machine learning has been used to predict developmental risks of mental health disorders and risk of suicidal/self-injurious behaviors, as well as how machine learning can be used to detect levels of Depression.

Canvas 2.0 - For Students by Students

Zachary Menter, Karen Bolka
Faculty Mentor/Collaborator(s): *Rushit Dave*

Many schools have online platforms that help teachers and professors distribute information and assignments, but they tend to lack in planning resources for students. There are a multitude of different homework planning and todo list applications out there, but few integrate well with a school's chosen instructional system. This poster presents the demand from the UWEC student body for a new homework planner application designed to integrate with Canvas, and the research into the necessary features for such an application. A survey was conducted of UWEC College of Arts and Sciences students regarding what features they would want in this Canvas 2.0 application. From this survey, we concluded that many students have a desire for a homework planner application like Canvas 2.0. Information from this survey was then taken and used to start designing and implementing the application.

Canvas 2.0: Implementation

Collin Petry, Stuart Scamehorn
Faculty Mentor/Collaborator(s): *Rushit Dave*

We are working on Canvas 2.0 because we believe that the current canvas site is lacking in useful features that students would benefit from having. The first feature we are working on is a to do list page for tracking homework, assignments, and other tasks relevant to a student's life. The to do list will feature basic adding and removing of tasks as well as ways to sort tasks by class, type, priority, due date with push notifications. The second feature is a Grade Point Average (GPA) calculator that can calculate both cumulative and semester Grade Point Average (GPA). These features were decided upon based on data from a survey conducted in the University of Wisconsin Eau-Claire College of Arts and Sciences. Based on the survey, these were the features that students showed the most interest in when asked what they would like to see in an organizational app the linked with Canvas.

Continuous User Authentication using Mouse Dynamics, Machine Learning, and Minecraft

Nyle Siddiqui
Faculty Mentor/Collaborator(s): *Rushit Dave*

Mouse dynamics has grown in popularity as a novel, irreproducible behavioral biometric. Datasets which contain general, unrestricted mouse movements from users are sparse in the current literature. The Balabit mouse dynamics dataset, produced in 2016, was made for a data science competition and despite some of its shortcomings, is considered to be the first publicly available mouse dynamics dataset. Collecting mouse movements in a dull, administrative manner, as Balabit does, may unintentionally homogenize data and is also not representative of real-world application scenarios. This paper presents a novel mouse dynamics dataset that has been collected while 10 users play the video game Minecraft on a desktop computer. Binary Random Forest (RF) classifiers are created for each user to detect differences between a specific user's movements and an imposter's movements. Two evaluation scenarios are proposed to evaluate the performance of these classifiers; one scenario outperformed previous works in all evaluation metrics, reaching average accuracy rates of 92%, while the other scenario successfully reported reduced instances of false authentications of imposters.

Continuous, Dynamic User Authentication using Mobile Touch Dynamics Based on Machine Learning

Zach DeRidder, Brendan Pelto
Faculty Mentor/Collaborator(s): *Rushit Dave*

This project consists of a machine learning model, namely a random forest algorithm, that was trained on user's touch dynamics while playing various mobile games. 25 UWEC student/faculty members played Minecraft and Slither.io for about 10 minutes for each game on an Android phone provided by the researchers. The experiment was held in a computer science lab on campus while a background app collected multiple data points from the various sensors within the phone. This data is then used to train the machine learning model as well as test the model to see if it can correctly identify each user based on the inputted data. Each user will have a non-personal ID number attached to their data solely for the model to distinguish each user during its training process.

Custom Smart Watch

Spencer Keith
Faculty Mentor/Collaborator(s): *Rushit Dave*

The purpose of this project was to build a custom smart watch from an open source design. Through this project, I was able to construct an affordable and fully programmable and customizable smart watch with WiFi and bluetooth capabilities. The watch utilizes a TTGO T Display development board with an ESP32 chip, a 3.7 V lithium polymer battery, an RTC module (real time clock), and a 3D-printed case. The watch is programmed in C++, and features several different "apps". These include the main watch face and a stopwatch (from original design), a Daily Checklist, a Weather Tracker (which pulls extensive and accurate weather data from an online API), a Terminal, and Network Settings. With continued development, I will add more "apps", and I have several in mind that I hope to begin development on when time allows. This project demonstrates an alternative solution to the desire for a smart watch, which

holds programmers and tech-enthusiasts in mind, and gives users the freedom to build and do whatever they want with their smart watch.

Data Mining for Smart Cities

Simon Arneberg, Nuo Xu
Faculty Mentor/Collaborator(s): *Rushit Dave*

As modern cities continue to develop, smart devices are being used to improve citizens' lives. As these devices become more sophisticated, the amount of information that they collect increases. A Smart City is a city that uses the large amount of generated data to constantly improve the services offered to the people that live there. Data mining techniques can be used to sift through the data and mine out meaningful patterns. Our research project focused on 7 different disciplines within a Smart City, surveying the current state of research in each category. Smart Transportation is focused on decreasing congestion, increasing efficiency in public transportation, and improving the safety of pedestrians. Smart Healthcare is focused on modern healthcare monitoring systems and ambulance dispatch services. Smart Energy is focused on decreasing energy consumption and promoting green energy through WiFi thermostat optimization and a smart electric grid. Smart City Utilities is focused on creating algorithms to improve waste collection techniques and air quality. Smart City Planning is focused on land use and the placement of green spaces. Smart Networks and Privacy is focused on secure networks. Lastly, Smart IoT (Internet of Things) Application is focused on the next generation networks like 5G.

Hold on and Swipe: A Touch-Movement Based Continuous Authentication Schema

Laura Pryor, Jacob Mallet
Faculty Mentor/Collaborator(s): *Rushit Dave*

In recent years, the amount of secure information being stored on mobile devices has grown exponentially. However, current security schemas for mobile devices such as physiological biometrics and passwords are not secure enough to protect this information. Behavioral biometrics have been heavily researched as a possible solution to this security deficiency for mobile devices. This study aims to contribute to this innovative research by evaluating the performance of a multi-modal behavioral biometric based user authentication scheme using touch dynamics and phone movement. This study uses a fusion of two popular publicly available datasets - the Hand Movement Orientation and Grasp (HMOG) dataset and the BioIdent dataset. This study evaluates our model's performance using three common machine learning algorithms; Random Forest, Support Vector Machine, and K-Nearest Neighbor reaching accuracy rates as high as 82%, with each algorithm performing respectively for all success metrics reported.

Criminal Justice

Forged in Fire: Rehabilitation on the Fireline

Cliff Hayes
Faculty Mentor/Collaborator(s): *Jason Spraitz*

This research seeks to achieve several goals, mainly to draw attention to a specific and understudied area of corrections—Carceral Firefighting programs. This study will achieve the above goal through a comparative analysis of Carceral Firefighting programs from the Western region of the United States, where such programs are most common. The analysis will focus on several key items, including, but not limited to: the number of program participants, level of training, whether they live in camps or stay in the prison, and so on. Additionally, the study will endeavor to highlight relevant legislation that impacts one's ability to serve as a firefighter following their term of incarceration; one example is California's recently passed Assembly Bill 2147 which allows for formerly incarcerated firefighters to use their training to serve in the same capacity upon release. Lastly, this study will highlight any transitional programs, should the state allow formerly incarcerated firefighters to be firefighters after their sentence is over as well as programs that have a framework for success in place, such as Arizona's Phoenix Crew.

Online Abuse on Popular Social Media App: What it Looks Like and How to Stop It

Mikayla Miller
Faculty Mentor/Collaborator(s): *Justin Patchin, Sameer Hindjua*

This study's purpose is to focus on the extent to which youth from the United States were being cyberbullied on a popular social media app. Surveys were sent for users to report the occurrence. Twenty percent of US Youth experienced online bullying on the app. Sixty percent of those youth said the experience negatively impacted their life and were less likely to use the app because of it. The most common reason for bullying was because of appearance. Forty-four percent of users said they were aware of tools to report bullying. The hope is to educate users and reduce the number of online bullying experience to zero.

#SayTheirNames: A Departmental Analysis of Police-Civilian Critical Encounters

Kylie Asselin, Anna Green, McKenzie Lehto
Faculty Mentor/Collaborator(s): *Ming-Li Hsieh*

The current study is the Phase II project derived from previous Phase I research that aimed at identifying discrepancies between the philosophy of Community Oriented Policing (COP) and its implementation across jurisdictions. This study examines whether those law enforcement agencies involved with citizen-injured or -killed incidents during police-citizen encounters would adhere to COP essences and also develop potential police reform initiatives. A total of 117 cases associated with 97 law enforcement agencies are identified from two #SayTheirNames websites (i.e., sayevery.name and saytheirnames.io) from January 2018 to December 2020. The content analysis revealed that four-fifths of agencies demonstrated core COP components (i.e., decentralization, geographically defined, close interactions with community) and half of them were rated with a high COP adherence. In terms of police reform, initiatives were made predominantly in changing mission statements followed by other tactical plan, structural plan

and police technology domains. One third of police agencies were rated as high police reform which covered these four domains.

Chippewa Valley Technical College (CVTC)

Military Service
Brandon Bailey
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Impact of Parenting Style
Kayla Bennett
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Online Vs Face-to-Face Instruction
Nick Connolly, Cameron Dwyer, Bryce Zwiefelhofer
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Artificial Intelligence Use
Daniel Dachel, Alex Moe, Addisen St. Yves-Kuglin
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Learning Format Preference
Gunnar Grams
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Impact of Concussion
Jacob Guenard
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Working While in College
Vianey Hernandez
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Stress
Maxwell Huston
Faculty Mentor/Collaborator(s): *Franki Larrabee*

How Music Makes You Feel
Jonathon Tessman
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Pets and Stress
Aliyah Daniels, Ana Dryden
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Internet Usage and Mental Health
Grady Holmes
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Impact of Gaming
Shawn Janvrin
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Impact of Sports on Mental Health
Blayde Lecher
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Screen Time
Kortney Mayer
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Success without College
Steven Shin
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Theater & Development
Anna Vallez
Faculty Mentor/Collaborator(s): *Franki Larrabee*

Representing Cultural Identities
Noriko Slowinski, Ryan Whiteside
Faculty Mentor/Collaborator(s): *Melody Brennan*

Expressions of Cultural Identities
Chrissy Grasley, Renee Sheflet
Faculty Mentor/Collaborator(s): *Shalyn Gagnon*

Economics

Un-Modeling Minority Myth of Asian Americans

Ziyang Xie, Yongxin Cai, Angelina Lind
Faculty Mentor/Collaborator(s): *Yan Li, Wayne Carroll*

The goal of our research is to discover differences in voting patterns between Asians and other races, and their endogenous causes. Since the onset of the COVID pandemic, there has been a significant rise in anti-Asian hate crimes across the United States. The Center for the Study of Hate and Extremism found racially targeted violence against Asians spiked by 150% despite the federal action. This reality is devastating, but not surprising to Asian communities, who have struggled with hate-motivated conduct throughout modern American history.In this project, we studied the nation's history of scapegoating of Asians that goes as far back as the 19th century, revisited the roots of the model minority paradigm, and analyzed why this model minority myth was pervasive and dangerous to the Asian Americans and Pacific Islanders (AAPI) communities. By examining data in Current Population Survey (2020), a logistic regression model was fit to determine factors which were associated with each ethnic group's voting participation. Overall, Chinese Americans had a lower propensity to vote than most other Asian ethnic groups. By contrast, Asian Indian Americans demonstrated stronger voting enthusiasm.Through this research, we hope to raise political awareness among Asian voters, call for racial and restorative justice, and pass a clear message along to the AAPI communities: that their votes and voices DO matter. In the meantime, we hope to direct more attention from political campaigns to AAPIs, which in turn will help empower AAPI voters and make their voices heard.

Using Survey Data from 2021 to Explore Barriers Limiting Usage of the Supplemental Nutrition Assistance Program-Market Match Incentive Program at the Eau Claire Farmers' Market

Annabelle Howat, Katie Klingbeil, Andrew Lindaas, Madelyn Zenner
Faculty Mentor/Collaborator(s): *Eric Jamelske*

Farmers' markets (FM) provide access to many fresh, local and healthy foods, especially FV, but low-income households are much less likely to shop at FM. The Eau Claire Farmers' Market (ECFM) offers a Market Match Program (MMP) to incentivize Supplemental Nutrition Assistance Program (SNAP) participants to shop at the market. Administrative data show that approximately 90% of eligible SNAP households never use the ECFM-MMP, while approximately 50% of SNAP households using the ECFM-MMP only shopped at the ECFM one time per season. In 2021, we conducted surveys of SNAP shoppers at the ECFM (N=149) as well as EC County SNAP households that did not shop at the ECFM (N=240) to identify barriers that limited/prevented people from using the ECFM-MMP as well as what factors might increase their ability to shop using SNAP benefits at the ECFM. The top barriers to using the ECFM-MMP were similar for both groups and included limited FM hours/locations, difficulty getting to/from FM, did not remember and can't get all food needed at FM. The factors that would increase usage of the ECFM-MMP were also similar for both groups and included a larger match amount, expanded FM hours/locations, increased awareness/reminders and mobile FM in neighborhoods.

Examining Chinese and American Climate Change Views using 2015, 2017 and 2020 Survey Data - Part I

Jesse Castellanos-Martinez, Philip Long, Lillian Roubinek, Megan Schiller
Faculty Mentor/Collaborator(s): *Eric Jamelske, James Boulter*

China (CH) and the United States (US) are key players in international climate change (CC) negotiations, and thus we conducted surveys in 2015 (N=7,556), 2017 (N=7,415) and 2020 (N=2,600) to better understand what Chinese and American citizens think about this very important issue. Selected survey questions were used to calculate a CC index (CCI) with higher values indicating more alignment with the scientific realities of CC. Comparisons are presented across countries using aggregate data for three years. Chinese CCI values were higher on average than for Americans, while there was more variation in American CCI values. Additionally, there was a significant partisan political division among Americans with liberals having the highest CCI values followed by moderates and then conservatives. Lastly, liberals and conservatives show the least and most variation in CC views respectively. This study transitions into a second presentation using the CCI as an explanatory variable to investigate correlations between CC views and other outcome variables of interest continuing to provide comparisons between countries. Specific attention will be given to the degree of variation in each country as well as the existence of a partisan political divide among Americans in these analyses.

Examining Chinese and American Climate Change Views using 2015, 2017 and 2020 Survey Data - Part II

Erica Kladar, Emily Krahn, Micah Link, Hannah Raddenbach
Faculty Mentor/Collaborator(s): *Eric Jamelske, James Boulter, Won Jang*

China (CH) and the United States (US) are key players in international climate change (CC) negotiations. We conducted surveys (N=17,571) in 2015, 2017 and 2020 to better understand what Chinese and American citizens think about this very important issue. Survey questions were used to calculate a CC index (CCI) with higher values indicating more alignment with the scientific realities of CC. We use the CCI as an explanatory variable to investigate correlations between CC views and other outcome variables of interest continuing to provide comparisons between countries. Possible topics include support for the Paris Agreement, willingness-to-pay for CC policy action and exploring themes from responses and comments from open-ended survey questions. Throughout both presentations, attention will be given to the degree of variation in CC views in each country as well as the existence of a partisan political divide regarding CC among Americans. Our preliminary findings suggest that Chinese citizens show more support for their country fulfilling its commitment to the Paris Agreement and are also willing to pay more to support CC policy action compared to Americans. Additionally, open-ended survey responses reveal significant anger/denial regarding CC among American citizens, while these feelings are almost non-existent in the Chinese responses/comments.

What Do You Do to Reduce the Effects of Climate Change? A Qualitative Investigation of Individual and Societal Actions

Phoenix Leary, David Xing Yi Lee, Ben Worner
Faculty Mentor/Collaborator(s): *James Boulter, Kristine Knutson, Eric Jamelske*

Climate change is one of the most pressing existential threats facing our world. A plethora of research exists that demonstrates that climate change is real and that it is human caused. To this growing body of literature, this study contributes knowledge about the actions that individuals in United States take to combat climate change, as well as their expectations for how society ought to address climate change. Using thematic analysis techniques (Norwell, Norris, White & Moules, 2017), participant responses to two open ended questions were analyzed (i.e., What actions have you or your family taken to reduce your personal contribution to climate change/global warming? and What societal changes do you think are most important to significantly reduce the effects of climate change/global warming?). Findings indicate that participants act and believe society ought to act in ways that coincide with cultural narratives for combating climate change (e.g., recycling, green purchasing, reducing consumption, and making transportation changes). The efficacy of these actions is discussed and suggestions for improving climate communication are offered.

English

Disagreement in a Remote Course on Race, Class, and Language

Ciaran Fenner
Faculty Mentor/Collaborator(s): *Lynsey Wolter*

In the age where remote learning has grown more common, especially in the wake of an ongoing pandemic, the issue of creating a learning environment digitally has also grown more common. Discussions can be crucial elements of college-level courses and in any discussion, the presence of agreement as well as disagreement is needed so different perspectives can be brought to light. This study aimed to examine how students interact with and discuss the text with their peers in a remote setting. We analyzed the spring 2021 class ENGL 325 “Language, Race, and Class in the US” and the annotations made by 18 students in the social annotation app, Perusall. The findings found a significant lack of disagreement, and of the disagreement present, seldom any disagreement between classmates. By analyzing the agreement and disagreement expressed in students' discussion, it was deduced that lack of confidence in students’ arguments along with concerns about politeness and harming relationships with fellow students played a major role in the absence of disagreement among students.

Psychological Safety during Peer Response in Writing Classrooms

Katie Scherger, Hannah Hawkins
Faculty Mentor/Collaborator(s): *Lynsey Wolter, Kaia Simon*

The purpose of this research was to examine the conditions of psychological safety during peer response activities in writing classrooms. Instructors frequently use peer response activities to create classroom community and generate feedback on writing, but there is little academic literature on the circumstances that produce psychological safety during those activities. This study consisted of two surveys: one survey was sent to the students involved in the four sections of the Spring 2021 Blugold Seminar in Critical

Reading and Writing and another survey was sent to the instructors of those classes. The survey was analyzed using Initial Grounded Theory to find common themes in the data. The preliminary findings indicate that students experience many sources of discomfort during peer response activities that result in psychologically unsafe conditions. Rather than being an activity where feedback is given and received and community is built, peer response becomes unhelpful, anxiety inducing, and socially jeopardizing. When not addressed by instructors, this undermines the peer response experience and student community.

Successful Peer Review in the Everyday Classroom

Hannah Hawkins, Katie Scherger
Faculty Mentor/Collaborator(s): *Kaia Simon, Lynsey Wolter*

Our research aimed to answer one essential question: What factors and materials are essential for quality and productive peer review? We conducted an anonymous survey of students and instructors in the Blugold Seminar program. Two central ideas emerged from our analysis: the social and emotional stakes of the exercise, as well as the necessary guidelines for peer review materials. Looking at peer review from student and teacher perspectives, we were able to develop best practice recommendations for peer review materials and the environmental and social factors surrounding the activity. As I was working on this research, I also observed peer review in an elementary classroom setting and.found that I was able to critically examine peer review activities. Ultimately, the results of this research project can help teachers at the elementary through college level more successfully integrate peer review into their classrooms.

The Turning Wheel: Ideology, Psychoanalysis, and Henry V

William O'Brien
Faculty Mentor/Collaborator(s): *Jan Stirm*

I seek to use Henry V to investigate how ideological assumptions and reading are linked. When reading, we make conjectures based on a set of ideological assumptions. The way Shakespeare constructs the narrative and ideologies of Henry V is a reflection of that reading process. By applying theoretical frameworks about ideology and psychoanalysis to Henry V, we see how the play functions as a turning wheel, constantly shifting the ideological spokes to evade a clear, objective reading. This turning wheel follows a similar pattern of movement as Jacques Lacan's triad of subject positions developed in his Seminar on The Purloined Letter. In any situation, there are viewers who are completely blind, viewers who see but are deluded to the "true" secrecy, and viewers who take on the role of analyst, believing they see the situation as it really is for a time. Yet, ideology is always working underneath the surface, eventually subverting the analyst's notion of clear, uninhibited sight. When we view Henry V and reading in this light, we find that, as critics, there is always an ideology that seeps into our work that complicates our search for truth, just as it does in the world of Shakespeare's drama.

Suburban Agriculture: Fulfilling Spaces, Creating Places - The Agricultural Potential of a Neighborhood

Erin Garvey
Faculty Mentor/Collaborator(s): *Paul Kaldjian*

Over the last two decades, urban agriculture has become an important feature of research on local food systems, supply, sustainability, and sovereignty. Thousands of articles have been published on the practice, place, and wide-spread social and environmental benefits of home, community, and market gardens in urban settings around the world. Curiously, however, almost no attention has been given to explicitly 'suburban' agriculture, despite the prominence of suburbia across North America. Our case study of a small, Midwestern city (Eau Claire, WI) begins to address that void by looking at the overlooked and under-appreciated agro-food potential of suburban lawns and yards. Using Google Earth Pro, standard GIS software, publicly available city assessor data, ground investigations, and actual home and community vegetable gardening practices, we estimated the agricultural potential of 132 household lots sampled from eight neighborhoods. Our findings demonstrate that suburbia is a repository of significant amounts of arable land and, consequently, agriculturally productive potential. Furthermore, sustainably developing suburban agricultural resources has the potential to address an array of local social, health, economic, environmental, and community needs. Our analysis demonstrates the significance of suburbs in the discourse on urban agriculture and makes a case for highlighting 'suburban agriculture' in future studies.

Low-Altitude, High-Resolution Multispectral and Thermal Remote Sensing for Crop Monitoring

Rebecca Rodgers, Nathan Moll
Faculty Mentor/Collaborator(s)*: Papia Rozario, Martin Goettl*

The applications of UAV (Unmanned Aerial Vehicles) in monitoring crops and forest cover have gained importance in the past years. Due increasing population and farmers aiming to meet the yield's expectations, nowadays agriculture could even be a threat to the environment. That is why researchers must seek better solutions and reliable techniques to preserve the environment and increase the potential of agriculture in a sustainable way. The aim of this project is to develop a method to monitor crops and vegetation by analyzing multispectral and thermal imagery in combination with UAV. Experiments were carried out in a site located in Eau Claire, Wisconsin, during the year 2021 crop season. By applying close range UAV photogrammetry, several index maps representing current ground condition values were created that were used to monitor crop and vegetation health of the study area.Key words: UAV, photogrammetry, vegetation indices, Index maps.

Using Deep Transfer Learning for Unsupervised Image Segmentation in Remote Sensing

Pavithra Mohan, Matt DeWitte
Faculty Mentor/Collaborator(s): *Papia Rozario, Rahul Gomes*

As multispectral image resolution has increased, generating accurate segmentation of these images can pose a significant challenge. Another hurdle is the presence of accurate labeled data which can require hours of manual segmentation. One solution to this problem is the application of deep learning algorithms which are able to learn non-linear trends in the data without significant preprocessing. Deep learning models can also be used for transfer learning. In this research, we demonstrate transfer learning on how a model trained on one dataset can be used for segmenting a different dataset. We explore the widely known Potsdam and Vaihingen images to achieve our objective. Using a specific deep learning algorithm called UNet, we first train our model on a dataset with class labels. We then use the trained model to extend a custom UNet structure which is able to transfer semantic knowledge from the previous training and also adapt to the unknown images. Preliminary results indicate that there is a potential to achieve higher accuracy by using optimized loss functions suited for unsupervised learning along with pre-trained weights from the trained UNet model.

A Spatial and Demographic Analysis of Cycling Safety Perceptions: A Case Study in Eau Claire, Wisconsin

Nathan Walker, Savanna Grunzke, Matthew St. Ores
Faculty Mentor/Collaborator(s): *Matthew Haffner*

Bikeable cities provide numerous benefits to the environment, individual citizens, and communities at large, yet safety is consistently cited as a major barrier to using a bike for transportation. Geospatial methods can provide insight into areas hazardous for cycling, for the allocation of municipality resources, and improving existing cycling transportation infrastructure, ultimately resulting in safer and more sustainable communities. Through a custom web mapping application, we surveyed citizens on their perceptions of unsafe cycling locations in Eau Claire, Wisconsin. Then, we applied spatial statistics to identify clusters of problematic areas within the city and discuss differences in responses between women and men. Through these techniques, we seek to gain a greater understanding of the relationship between the built environment and the perceived bike safety in Eau Claire's mobile spaces. While the results have tangible transportation planning implications for the city, more importantly, the free and open-source software developed for this project, along with the methods more generally, could be easily utilized in other municipalities to discover novel patterns.

Archaeological Ground Penetrating Radar Investigation of the Bersohn and Bauman Jewish Children's Hospital in Warsaw, Poland: Locating Potential Holocaust Artifacts

Grace Uchytil, Abigail Fischer, Noah Hall
Faculty Mentor/Collaborator(s): *Harry Jol, Alastair McClymont (BGC Engineering), Paul Bauman (BGC Engineering), Jacek Konik (Warsaw Ghetto Museum), Philip Reeder (Duquesne University), Connor Jol (University of British Columbia), Joe Beck (University of Wisconsin-Eau Claire), Richard A. Freund (Christopher Newport University), Kayla Singleton (Christopher Newport University), Mikaela M. Dettinger (Christopher Newport University), Colin Miazaga (BGC Engineering Inc)*

During the Holocaust, the Warsaw Ghetto, in Warsaw, Poland became one of the major centers for Jewish confinement. Near the center of the Warsaw Ghetto was the Bersohn and Bauman Jewish Children's Hospital. This was a fully functional hospital which opened in 1878 but became overloaded with patients during World War II. Ground penetrating radar (GPR) was used to investigate the basement of the hospital, and the only undisturbed grassed land adjacent to it, a courtyard behind the building. Multiple GPR surveys were conducted to determine if any buried historical artifacts or human burials are still present, suggesting Jewish resistance. The surveys were conducted using a PulseEKKO Pro GPR system with an antennae frequency of 500 MHz, a 2cm step size, and a 0.25m line spacing for all grids. Data was then processed using EKKO_Project software. "V" and channel like shaped reflection patterns are observed in the courtyard and hyperbolic patterns in the basement. The reflections indicate the potential presence of hole like features and pipes. Any discoveries made at the hospital will aid in telling the story of how Jewish people attempted to preserve items as evidence of their existence during the Holocaust.

Ground Penetrating Radar Investigation of the Nebraska Sandhills

Abigail Fischer, Grace Uchytil
Faculty Mentor/Collaborator(s): *Harry Jol, Paul Hanson*

The Nebraska Sandhills are vegetated aeolian (windblown) sand dunes in the Great Plains region. Characteristics of the climate such as wind and humidity influence the formation of sand dunes such as the Nebraska Sandhills, therefore sand dunes are climate change indicators. The goal of this research is to interpret ground penetrating radar (GPR) data on the Nebraska Sandhills to gain an understanding on how the climate in the Great Plains region has changed over time. GPR is a noninvasive geophysical method popularly used in geomorphic research. GPR images the subsurface by transmitting electromagnetic (EM) pulses into the ground and recording the EM reflections. Multiple 200-meter long GPR lines were collected on the Nebraska Sandhills. The PulseEKKO Pro GPR system was operated at a frequency of 100MHz, and a odometer triggered 0.25m step interval. The GPR data was post processed using EKKO_Project software. The Topcon Laser Leveler was also operated on the Nebraska Sandhills to geometrically correct the GPR data for elevation. Topographic data points were collected along the GPR lines at a 2-meter interval. Upon assessment of the data, I expect to see dipping reflections in the internal stratigraphy which signifies a period of dune migration.

Holocaust Archaeology: Ground Penetrating Radar Subsurface Imagining of the Mila 18 Memorial in Warsaw, Poland

Noah Hall, Abigail Fischer, Grace Uchytil
Faculty Mentor/Collaborator(s): *Harry Jol, Richard Freund, Philip Reeder, Alastair McClymont (BGC Engineering), Paul Bauman (BGC Engineering), Jacek Konik (Warsaw Ghetto Museum), Philip Reeder (Duquesne University), Connor Jol (University of British Columbia), Joe Beck (University of Wisconsin-Eau Claire), Richard A. Freund (Christopher Newport University), Kayla Singleton (Christopher Newport University), Mikaela M. Dettinger (Christopher Newport University), Colin Miazaga (BGC Engineering Inc)*

During WWII the Nazis committed a mass genocide against the Jewish people. During the German occupation of Poland, the Germans established the Warsaw Ghetto. A group called the Jewish Combat Organization rose up against this tyranny. The headquarters of this group was located in a bunker under 18 Mila Street. On May 8th, 1943, the bunker was discovered and gassed by the Nazis. This project aims to use ground penetrating radar (GPR) to investigate the site where the memorial is located looking for possible escape routes used out of the bunker. A grid of 22m x 30m was collected north of the memorial. 120 total lines were collected with a line spacing of 0.25m. A pulseEKKO Pro GPR system was used with an antennae frequency of 500 MHz and a step size of 0.02m. Within the data there are two elongated hyperbolic patterns approximately 1m in depth that run across the entire 30m area. These line up with the location of the old Muranowska Street that existed in 1943. This street was parallel to Mila Street on the other side of the bunker and wider. Although escape tunnels weren't located it's important to locate the old road and bunker.

Investigating the Internal Stratigraphy of Foredunes of the Duluth Barrier System: Application of Ground Penetrating Radar on Aeolian Landforms Critical for Protecting Vulnerable Lakeshore Communities

Mallory Woodle, Hunter Delikowski
Faculty Mentor/Collaborator(s): *Harry Jol, Connor Jol (University of British Columbia)*

The Duluth Barrier System (DBS) is a narrow spit of land west of Lake Superior, connecting Duluth, MN and Superior, WI. Lake Superior is important for economic and recreational means, but recent high lake levels threaten the infrastructure and livelihood of DBS coastal communities. Foredunes, shore-parallel dune ridges that form due to wind action, consist of sand that is deposited on the vegetated shore. Foredunes protect shorelines because they are situated along the beach where waves cause erosion. Ground penetrating radar (GPR) was used to analyze the internal stratigraphy of foredunes along the DBS. GPR is a non-invasive geophysical tool that sends EM pulses into the ground, to image the subsurface. Four lines were collected using the pulseEKKO Pro system at a 0.02m step interval, triggered by the odometer, with a 500 MHz frequency antennae. Topographic data was collected with the Topcon RL-H4C laser level. Upon initial assessment and post-processing of the data, results are consistent with other previously conducted research and literature using GPR on foredunes. Dipping reflections suggest the occurrence of sediment accretion and erosion. The data will provide a better understanding of the internal stratigraphy of foredunes which will benefit DBS coastal communities.

The Good Nazi: Communicating UWEC's Undergraduate Research with Film

Luke Burds, Joe Beck, Ricky Mataitis

Faculty Mentor/Collaborator(s): *Harry Jol, Alastair McClymont (BGC Engineering), Paul Bauman (BGC Engineering), Jacek Konik (Warsaw Ghetto Museum), Philip Reeder (Duquesne University), Connor Jol (University of British Columbia), Joe Beck (University of Wisconsin-Eau Claire), Richard A. Freund (Christopher Newport University), Kayla Singleton (Christopher Newport University), Mikaela M. Dettinger (Christopher Newport University), Colin Miazaga (BGC Engineering Inc)*

In recognition of Yom HaShoah, the film tells the story of Major Karl Plagge, a Nazi officer who, during the Holocaust, was commandant of a forced labor camp called "HKP" in Vilnius, Lithuania. In reality, he was sheltering hundreds of Jewish families. By the end, many were saved in hiding places dug into the ground and carved into the walls. Many more were executed by the SS and buried in a mass grave. Today, the former "HKP" is unchanged. A group of scientists, including UWEC faculty and undergraduate students, arrive to locate the hiding places of those that were saved and identify the mass grave of those who were murdered. A child survivor of the camp and an American physician, whose mother was saved by Major Plagge, join them. The film tracks their three stories and, ultimately, brings to light the unknown tale of a Schindler-type German who listened to his conscience, instead of his superiors.

The Ringleblum Archives, Documentation of Life During the Holocaust: a Ground Penetrating Radar Investigation of Krasińskich Park, Warsaw, Poland.

Abigail Fischer, Grace Uchytil, Noah Hall

Faculty Mentor/Collaborator(s): *Harry Jol, Alastair McClymont (BGC Engineering), Paul Bauman (BGC Engineering), Jacek Konik (Warsaw Ghetto Museum), Philip Reeder (Duquesne University), Connor Jol (University of British Columbia), Joe Beck (University of Wisconsin-Eau Claire), Richard A. Freund (Christopher Newport University), Kayla Singleton (Christopher Newport University), Mikaela M. Dettinger (Christopher Newport University), Colin Miazaga (BGC Engineering Inc)*

Noninvasive geophysical methods were used in Krasińskich Park, Warsaw, Poland, to search for the Ringelblum archives: A buried time capsule containing documents that portray Jewish life during the Holocaust. The Ringelblum archives are buried near the former location of the Brushmakers Factory, a building in the Warsaw Ghetto that's now potentially buried under Krasińskich Park. The methods used to search for the Ringelblum archives include ground penetrating radar (GPR), electrical resistivity tomography (ERT) (a method that measures the electrical resistivity of materials), and EM61 (a high-resolution, time domain metal detector). Results from the EM61 directed the location of two GPR surveys, and a third grid was collected over a memorialized Warsaw Ghetto wall. GPR data was collected with a pulseEKKO Pro system with 500 MHz antennae frequency and an odometer triggered 2cm step interval. GPR data was post processed using EKKO_Project software. The GPR results from two grids suggest presence of buried ghetto walls. GPR results from the remaining grid include a reflective pattern interpreted as a metal object. The reflective pattern inspired the archeologists at the Warsaw Museum to conduct an excavation. Although the Ringelblum archives were not found during the excavation, many other Holocaust related artifacts were recovered.

Geology

Analysis of Lunchtime Waste-Sorting Habits: The BluBox Sustainability Initiative at UW- Eau Claire

Henry Scamehorn, Mark Fiore, Tucker Holloway, Braedon Laundrie, Cassidy Reitz, Ben Young
Faculty Mentor/Collaborator(s): *Scott Clark*

The implementation of the BluBox program, which was initiated during the fall 2021 semester, seeks to reduce the number of single-use plastic and compostable food containers in the waste stream at Davies Student Center. Students' lunchtime waste disposal behaviors have been studied at Davies for the past six years. During that time numerous waste-sorting behavior interventions by multiple sustainability stakeholders have been attempted. The implementation of the BluBox program is the most significant intervention to date. Our research documents the impact of the BluBox program. We collected observation data on students' disposal habits, and conducted waste stream audits. Key Findings were that 1) single-use food containers (excluding Sushi Do containers) in the waste stream (e.g., compostable and plastic clamshells and compostable plates and boats) have dropped to near zero; 2) misplaced food waste (i.e., food going into the landfill instead of compost bin) remains high; and 3) no other significant changes in disposal habits were recorded. Based on our findings, we recommend future interventions to further improve the waste streams at Davies Student Center: creation of a short informational video, design of a training module to be incorporated into freshman orientation, addition of an open-lid food bin next to the BluBox return bins, and getting Sushi Do to join the BluBox program.

Disposing of Myths Surrounding Lunchtime Waste

Mark Fiore, Henry Scamehorn, Ben Young, Cassidy Reitz, Tucker Holloway, Braedon Laundrie
Faculty Mentor/Collaborator(s): *Scott Clark*

Waste studies over the past six years on UW-Eau Claire students' lunchtime waste sorting habits in the Davies Student Center have shown that even with numerous interventions aimed at promoting sustainable disposal habits, no significant improvements in those habits have been detected. However, a potentially effective intervention would be the creation of a short informational video that can be widely distributed. Our brief, informative, and engaging video aims to influence the waste-disposal habits of students, staff, and campus guests by focusing on three key points: 1) proper and improper sorting practices; 2) why waste sorting is important at the individual level; and 3) ways we can attain broader sustainability goals on campus. The length of the video was kept to 2m20s will allow for maximum exposure on social media platforms and is intended to retain viewer interest. This video is a novel way to show students the importance of their individual contributions to a sustainable waste stream. It is our hope that it will encourage them to contribute to a more sustainable campus and to carry these waste-sorting habits with them after they graduate.

Liquid Immiscibility and Sequential Extraction in the Main and Upper Zone of the Bushveld Layered Mafic Intrusion, RSA.

Jake Huffaker, Michaela Schnell, Kalie Ress
Faculty Mentor/Collaborator(s): *Phillip Ihinger*

The Bushveld intrusion in southern Africa is the world's largest mafic intrusive body. The evolution of LMIs are not well understood. We present a comprehensive analysis of whole-rock geochemical data compiled from individual studies on subsets of the intrusion. We assimilate data from drill cores and surface samples that span the full thickness of the intrusion. For the Main and Upper Zones of the Bushveld, our findings are consistent with a recent model (Ihinger, 2017) invoking liquid immiscibility with subsequent compaction of the crystal mush trapped within isolated, crystal-rich boundary layers. The immiscibility process generates complementary Fe and Si-rich liquids with extreme density differences. In this model, the Fe-rich liquids sink within the pile, often forming horizontal seams of *Ti*, V-rich magnetite and ilmenite ores. The bulk of the intrusion is comprised of a series of crystallized convective boundary layers, with buoyant expulsion of felsic liquids that accumulate at the top of the magma chamber. We compare the observed geochemical trends of the Bushveld to those of the Sept Iles and Skaergaard intrusions. Our model offers an explanation for the association of granite bodies with LMIs, and resolves a long-standing dispute in the literature about missing silica in these intrusions.

Revisiting the Magmatic Evolution of the Sept Iles Layered Mafic Intrusion, Quebec Canada

Jake Huffaker, Michaela Schnell, Kalie Ress
Faculty Mentor/Collaborator(s): *Phillip Ihinger*

The Sept Isles intrusive magmatic body of Quebec, Canada is a well-preserved and well-exposed layered mafic intrusion (LMI). LMIs contain essential ore-bearing deposits, and they offer important clues to the evolution of crystallized basaltic magma, which forms >75% of Earth's surface. Here we re-interpret variations in the whole-rock geochemical data collected from throughout the Sept Iles intrusion (Namur et al., 2010; 2011) using a provocative new model invoking liquid immiscibility of the crystal mush within isolated convective boundary layers on the intrusion floor (Ihinger, 2017). We show that the creation of complementary *Fe*- and Si-rich conjugate liquids in the mush can account for: 1) enrichment of *Fe*-, *Ti*-rich minerals within the residual compacted layers; 2) occasional formation of extensive magnetite ore seams; and 3) the presence of a granitic cap on the top of the intrusion. Immediately following immiscibility, successive pulses of buoyant, Si-rich liquid ascend through the overlying magma chamber to form the composite granite cap, in agreement with observed intrusive relations. We compare our analyses to the corresponding observations of the Bushveld and Skaergaard intrusions and show that all three magma bodies crystallized in similar fashion.

U/Pb Geochronology of the Pembine-Wausau Terrane of the Proterozoic Penokean Orogen, Wisconsin

Evan Weber
Faculty Mentor/Collaborator(s): *Robert Lodge*

This study examines zircons from multiple deposits and outcrops throughout the Pembine-Wausau terrane to determine when they were formed and the significance of their timing. The Pembine-Wausau terrane is

a juvenile arc system that was developed through subduction during the Penokean Orogen. The terrane stretches across northern Wisconsin and hosts many deposits varying in lithologies. The areas of interest in this study include the Eisenbrey and Lynne deposit, Big Falls, and Little Falls. Samples from these areas were obtained through drilling efforts, or through field trips where samples were gathered from exposed outcrops. The collected samples were crushed, pulverized, and underwent mineral separation in order to isolate zircons. Zircons are commonly used for radiometric dating because they contain two element decay series, allowing the cross-check of the results with both decay series. The zircons were then analyzed at Laurentian University (Sudbury, Ontario, Canada) via Laser Ablation Inductively Coupled Plasma Mass Spectrometer (LA-ICP-MS). The data was then analyzed and plotted on Concordia diagrams to determine the concordant ages of the samples. The results were then compared to other geochronologic studies throughout the Pembine-Wausau terrane, and the results were significant and intriguing.

Comparing Mafic Chemostratigraphy at the Sturgeon Lake and Shebandowan Greenstone Belts

Shelby Short
Faculty Mentor/Collaborator(s): *Robert Lodge*

Archean greenstone belts are recognized worldwide due to their capacity to contain locally concentrated, economic mineral deposits. However, understanding the geodynamic setting of these greenstone belts and thus the controls of these metallurgical resources are still being debated. This study looks at two greenstone belts, Sturgeon and Shebandowan, and uses transect mapping and mafic chemostratigraphy to compare the two in hopes of confining the tectonic setting in which they formed. Sturgeon and Shebandowan greenstones belts located in the Superior Province along the Minnesota-Ontario Boarder formed in the Neoarchean as a result of the Wawa Abitibi Terrane accreting on the Superior terrane. Both greenstone belts are composed of vast mafic stratigraphic sequences that have been mapped through various projects. By compiling these datasets, a large scale spatial and geochemical comparison can occur. Spatially, ArcMap is used to project each sample on a geologic map of the greenstone belts. Geochemically, ioGAS is utilized to conduct geochemical analyses that are diagnostic of geodynamic setting. Analyses such as *Nb/Th, La/Yb*, or *Th/La* ratios can then be plotted on ArcMap to correlate geochemical trends to spatial location and individual greenstone genesis.

Hydrothermal Paragenesis of the Lynne Zn-Pb-Cu Deposit

Elinor Davis
Faculty Mentor/Collaborator(s): *Robert Lodge*

The 1.8 *Ga Zn-Cu-Pb* Lynne Deposit is a stratabound volcanogenic massive sulfide (VMS) deposit located in Oneida County, Wisconsin. It is located in the Pembine-Wausau terrane formed during the Penokean orogeny. It was discovered in 1990 by the Noranda Exploration and drill cores were taken from the deposit. The deposit contains massive to semi-massive sulfide lenses amidst interbedded rhyolites, chemical sedimentary rocks, and volcaniclastic rocks. The deposit contains mafic and felsic intrusions, as well as areas of hydrothermal alteration including talc, calcite, skarn, and brecciation. The abundance of calcite and talc alteration is unusual for a typical VMS deposit. This project investigates the talc and calcite alteration to determine their paragenesis and relation to the sulfide mineralization. Six holes of core were re-logged and samples of alteration zones were obtained to make polished petrographic thin sections. Preliminary macro- and microscopic examination of core samples indicate that both the talc and

calcite alteration styles have replaced the original volcaniclastic rock. The calcite alteration is observed to cut into areas of sulfite mineralization. The relationship between the calcite and talc alteration is not yet clear. The results are compared to other VMS deposits with similar alteration assemblages.

Petrogenesis of the Volcanic and Intrusive Rocks of the Lynne Zn-Cu-Pb Deposit, Oneida Co. Wisconsin

Lilly Glodowski
Faculty Mentor/Collaborator(s): *Robert Lodge*

The purpose of this research is to further constrain the volcanic and tectonic setting at the Lynne *Zn-Cu-Pb* deposit in Oneida County, WI. The Lynne Deposit, discovered in 1990, is one of many volcanogenic massive sulfide (VMS) deposits located in northern Wisconsin. VMS deposits are commonly associated with submarine volcanism in extensional tectonic settings and form when hydrothermal fluids precipitate sulfide minerals such as copper, zinc, and lead. The environment for Wisconsin VMS deposition is currently interpreted as back-arc volcanism due to the accretion of the Pembine-Wausau Terrane onto the Superior Craton during the Paleoproterozoic Penokean Orogeny (1.8-1.9 Ga). Volcanic units at the Lynne deposit were previously divided by their stratigraphic position relative to the ore horizon. Major and trace element geochemistry and petrographic observations from the volcanic host rocks show there is no chemical difference between the upper and lower horizons, and the volcanic units are therefore distinguished compositionally. Additionally, the intrusive rocks at Lynne are geochemically indistinguishable from the volcanic host rocks, suggesting they are a part of the same magmatic system. Continued geochemical and geochronological analyses will allow for improved metallogenic models and tectonic interpretations of similar deposits across the Penokean Orogeny.

Petrographic and Geochemical Analysis on Alteration Assemblages at Flambeau Zn-Cu Deposit, Rusk Co. WI

Tara Lemke
Faculty Mentor/Collaborator(s): *Robert Lodge*

The purpose of this project is to determine element mobility and better characterize defining textures and geochemistry of the alteration assemblages within the Flambeau Zu-Cu Deposit located in Rusk Co., WI.. The Flambeau deposit is a part of a chain of volcanogenic massive sulfide (VMS) deposits found within Wisconsin's 1.9-1.8 Ga accreted volcanic arc, Pembine-Wausau terrane. Although the Flambeau deposit was mined in the 1990's, studying the deposit provides valuable insight into the geologic history of Wisconsin and VMS deposits. Mass balance geochemical analyses are used to characterize the altered rocks, showing element mobilization throughout the hydrothermal history of the deposit. Element mobility during ore formation will allow for comparisons to be made between other deposits in Wisconsin. Previous studies have shown strongly foliated and metamorphosed alteration assemblages and sericite-rich alteration zones. This study will add additional mass balance and petrographic data to further characterize the alteration found at the Flambeau deposit.

Constraining Potential Phosphorus Sources in a Stratified Drainage Lake in Western Wisconsin

Maddie Palubicki, Bryanna Rayhorn, Jacob Huffaker
Faculty Mentor/Collaborator(s): *Sarah Vitale, J. Brian Mahoney, (Non-UWEC - Anna Baker, Laurel McEllistrem)*

Regional analysis in western WI demonstrates that phosphorous (P) concentrations are anomalously high in both surface water and groundwater. Lake eutrophication events are common in western WI and generally attributed to anthropogenic nutrient loading from surface runoff. However, high levels of P detected in regional aquifers suggest that groundwater discharge may be a contributing factor in eutrophication events and that the regional geology may be a significant source. A case study of a stratified drainage lake in Barron County was conducted to determine the potential contribution of lacustrine groundwater discharge to P loading. Data collected 2018-2021 show high P concentrations (100-700 ppb) in shallow and deep groundwater with especially elevated concentrations on the east side of the lake. Other water quality parameters and spatial distribution of P imply that septic sources are unlikely and suggest that agricultural sources may not always be a dominant contributor. Cambrian bedrock in the drainage basin may have a notable P contribution on the east side of the lake, supported by bedrock geochemistry and similar P concentrations to nearby municipal wells (400-600 ppb). West side P may be sourced primarily from localized agricultural sources indicated by elevated nitrate concentration and less elevated P (~200 ppb).

Measuring Stream Baseflow Conditions in West-Central Wisconsin

Gillian Streeter, Mark Fiore, Braedon Laundrie, Geni Streble, Kalvin Watt, Ethan Ahlbrecht,
Faculty Mentor/Collaborator(s): *Sarah Vitale, Nicole Clayton (WI DNR)*

This study seeks to measure baseflow conditions in West-Central Wisconsin to aid in determining the impacts of groundwater withdrawals on local streams. Data have been collected at sixteen (16) sites across eleven (11) streams from 2019-2021. Streamflow is measured once or twice per month during baseflow conditions using an OTT Hydromet MF Pro Flow Meter. Streams with two or more sites are used to determine if streams are gaining or losing water. A stream gage and seasonal pressure transducer have been installed at four sites to establish a relationship between the stream's stage and discharge. This study is conducted by the University of Wisconsin-Eau Claire in partnership with the Water Use Section at the Wisconsin Department of Natural Resources

Three-Dimensional Mapping of Eau Claire County Aquifers

Angy Rafferty
Faculty Mentor/Collaborator(s): *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 moving them to DNR 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.

Spatial and Temporal Variations in Regional Surface Water and Groundwater Chemistry in Western Wisconsin

Bryanna Rayhorn, Madeline Marchiafava
Faculty Mentor/Collaborator(s): *J. Brian Mahoney, Sarah Vitale, Laurel McEllistrem*

The intensity and severity of lake eutrophication events in western Wisconsin are increasing over time. Increased silica sand mining and CAFOs in western WI has generated concerns about potential contamination of surface water and groundwater. The baseline chemical characteristics of the regional hydrologic system need to be documented, and this investigation is the first comprehensive analysis of surface water and groundwater chemistry in the northeastern upper Mississippi River watershed. The dissolved metal content of surface water sites (n=54) and municipal groundwater wells (n=13) has been quantified to evaluate temporal variations in water chemistry. Initial results demonstrate that surface water and groundwater in the region is very clean, with virtually all trace metals below EPA drinking waters standards. The exception is P, which exceeds applicable standards in both surface water and groundwater. Results from 2016/17 and 2020/21 show that large rivers, (e.g. Chippewa R) are low in P, likely due to dilution, whereas many smaller rivers show elevated P concentrations. Annual P concentration varies across the region, perhaps due to variations in geology, drainage basin size and land use. Analysis of regional aquifers, including alluvial, Paleozoic sandstone/limestone, and Precambrian bedrock reservoirs, indicate water quality is quite good. The exception is the Mt. Simon Sandstone aquifer, which consistently shows high Mn, Fe, and P throughout the year.

History

The All-American Witch Hunt: Examining the Constitutionality of Venereal Disease Control from 1918 to the 1970's

Dana Athmann
Faculty Mentor/Collaborator(s): *Patricia Turner, Dr. Adam Kunz*

Among the many concerns of the United States government in the aftermath of the first World War, controlling the spread of venereal diseases, or sexually transmitted infections, was a notably high priority. In order to protect its soldiers, and the general public, from the dangers of ‘loose’ women, the government promoted statutes, reforms, and movements geared toward the suppression of syphilis and gonorrhea – and consequently, the oppression of women across all ages, faiths, and ethnicities. The decades of compulsory examinations and involuntary detainment with no due process, raises the question: why was something seemingly so unconstitutional allowed to continue for nearly half a century? Most of the existing research on this topic focuses on the ‘what’ or the ‘why’; that is: what types of treatments took place?; why were women considered suspicious and not men?; and what forms of propaganda were used?

In contrast, this paper aims to use a constitutional lens to explore the 'how'. By using primary sources such as federal, state, and local court cases, records from the 65th and 75th Congress, and federally and state issued statutes and regulations, this project argues that the US government was able to circumnavigate the constitution in order to encourage and fund the modern-day witch-hunt of tens of thousands of women across the country. This argument is supported by three points of analysis: federal legislation, funding and support from the states, and the backing of the court system. For nearly 50 years, women in America were, quite literally, guilty until proven innocent. Their stories may not be well known, but they still deserve to be told.

The Decline of British Identity: The Rise of Regional Nationalism in the United Kingdom (1973-2016)

Jesslynn Sitko
Faculty Mentor/Collaborator(s): *Patricia Turner, Louisa Rice*

In the mid to late 20th century, British Identity appeared to be weakening in the face of growing regional identities in England, Scotland, and Wales. Many citizens believed British identity to be tied to accomplishments and the monarchy, but there is a more complex understanding of the idea of identity. This project focuses on the timeline from 1973 when the United Kingdom entered the European Union to 2016 when the UK referendum on membership in the EU was passed. Brexit reflects the weakening of British identity because England wanted to leave the EU and Scotland wanted to stay. Brexit brought to light the separate regional ideals within Great Britain. This project compares the sources of British identity such as the Monarchy and the royal family to the sources of regional identity such as the Miner's Strike of 1984, Margaret Thatcher, and regional nationalism of Scotland and Wales. It utilizes primary sources such as speeches from the Queen, referendum results, newspapers, and government acts. From the year 1973 to 2016, it is apparent that there is a slow decline in people who are in favor of being a part of the British identity. This decline is due to an increase in nationalism from Scotland and Wales, as well as events that affected people in negative ways such as the miner's strike in 1984, the influence of Margaret Thatcher, and European Union membership.

Wisconsin Women's Labor on the Homefront During the Civil War

Tiffany Goetz
Faculty Mentor/Collaborator(s): *Joanne Jahnke-Wegner*

My project explores the missing history of women's labor in Wisconsin during the Civil War, particularly, the additional and invisible labors they performed in the absence of men. Historians of women's work during the Civil War era have examined women's movement into health and hygiene, including nursing and their work with the United States Sanitary Commission, their movement into industrial labor and government work, and the expansion of women's public economic roles during the market revolution, but what remains to be fully explored is how the war impacted women's work in Wisconsin, a state that was not significantly populated at the time. I conducted archival research to find primary source documents, including the diaries and letters of Wisconsin women, to better understand how their work changed during wartime. I argue that, regardless of social class, Wisconsin women's labor during the Civil War and Reconstruction expanded to include additional agricultural, economic, patriotic, and emotional labor beyond peacetime norms and in the absence of their partners.

Kinesiology

Acute Impact of Resistance Exercise on Premenstrual Symptoms in College-Aged Non-Exercising Eumenorrheic Females

Elizabeth Packer, Grace Palubicki, Nevaria Rumery, Emily LaMarche, Emily Flaskrud, Ashley Hall
Faculty Mentor/Collaborator(s): *Jeffrey Janot, Saori Braun*

Premenstrual syndrome (PMS) includes cyclic characteristics of physical, cognitive, and behavioral symptoms and occurs in 90% of females. There is a growing need for research on how non-drug therapies can potentially mitigate PMS symptoms. In past literature, there is mostly an emphasis on aerobic exercise (AE). This study compares resistance exercise (RE) to AE and its acute effect on PMS. Participants were 11 college aged, non-exercising females who engaged in exercise 2 days before and during menses. A total of 4 exercise sessions were completed, 2 AE and 2 RE. PMS symptoms were tracked through a questionnaire pre-, post-, and 2-hours post exercise. A two-way ANOVA indicated a difference in pain at pre-menstruation ($p=0.034$) and during menstruation ($p=0.020$). For negative effect ($p=0.006$), concentration ($p=0.004$), and water retention ($p=0.004$), there was a significant change in symptoms pre-menstruation ($p=0.006$) based on timing of exercise. The difference between modalities (RE and AE) was not significant for any domain. There was no significant difference between the modes of exercise, indicating that AE may not be superior to RE when mitigating PMS symptoms. It can now be further supported to prescribe exercise as treatment to alleviate PMS symptoms before pharmaceutical means are needed.

Languages

Language Revitalization Programs: What's Working? What's Not?

Madalyn McCabe, Aidan Sanfelippo
Faculty Mentor/Collaborator(s): *Wendy Makoons Geniusz*

This research investigates the successes, challenges, and themes of past and present Indigenous language revitalization programs to help build a foundation that current and emerging programs can use to succeed. This information was found in, but not limited to, books, articles, and interviews from successful individuals and organizations in the field of language revitalization, including Leanne Hinton's Bringing Our Languages Home: Language Revitalization for Families and an interview with Anton Treuer. This project was designed as preliminary research for a distinctive university-level course to teach university students about careers they could pursue in Indigenous language revitalization. This research could be useful for current and emerging language revitalization programs and for those thinking about working in this field. The overarching goals of these programs are to combat systemic oppression and to promote the reclamation of Indigenous culture that has been suppressed by colonization. Dr. Geniusz and her student collaborators have recorded successes and challenges of language revitalization programs, tips on funding, and structures of current and past Indigenous language programs. They have compiled them into a list of best practices for planning and implementing these programs, which are already being disseminated to various Indigenous language revitalization programs to bolster this process. This research was funded by a SOTL Grant.

Management and Marketing

Vision 2025- Directory of Programs Initiative

Shay VanEyll
Faculty Mentor/Collaborator(s): *Douglas Olson*

How can we make it easier for students to find information on healthcare administration programs? Additionally, how can we assist professionals and providers in the field to network with universities? By creating a directory containing information on approximately 60 national health care and services administration academic programs focused on aging services, we will be able to create one of the critical needs for students, professionals, and providers to gain more information and contacts. The Vision 2025: A Game Changer event was held on June 22nd, 2021. At this event professionals from across the Nation gathered to talk about the next steps to meet the goals of the VISION 2025 project and discuss how to support the programs for students, faculty, and professionals. The goals of VISION 2025 are to create at least 25 robust university and college programs, 1000 paid internships for students, and university/provider partnerships. Hearing from these professionals in the workforce helped create the criteria for information needed to create a successful directory. After hearing from professionals, a workgroup has been charged with supporting this specific effort. The poster will share the overall progress of the initiative, along with the future steps being taken to ensure success.

The 2019 National Emerging Leadership Summit: Developing Solutions to Enrich Lives

Mitchell Gordon, Drew Flores, Ethan Cole
Faculty Mentor/Collaborator(s): *Jennifer Johs-Artisensi, Douglas Olson, Frances Hawes*

As the number of Americans 65 and older rises, more people will require senior care and services. Strongly developed long-term care leaders are needed to meet this challenge. The National Emerging Leadership Summit (NELS) gives health service executives a chance to be heard and advance changes within long-term care. Health service executives attended NELS in Washington D.C. in 2019 where they shared perspectives on challenges within their profession. Participants presented three action plans to address problems in long-term care. The first focused on recruitment and retention, including a strategy of reaching out to high schools to interest younger students. The second centered on increased support for new administrators, with a suggestion of a virtual “Administrator’s Guide" as a resource for administrators. Finally, a third focused on creating informal Nominator(s)ship opportunities for administrators to connect with professionals to share best practices. NELS continues to promote professional development for health service executives in long-term care. Beyond sharing results from NELS 2019, updates on 2020 and 2021 NELS events will be shared, along with plans for NELS 2022. The 2022 theme, “The Power of Partnerships”, is intended to give synergy to the enthusiasm and ideas of NELS participants and the broader profession.

The Silver Linings of COVID-19 in Long Term Care

Hannah Keach
Faculty Mentor/Collaborator(s): *Jennifer Johs-Artisensi, Lindsey Creapeau*

Silver Linings of COVID-19 in Long-term Care Long-term care facilities were hit hard by the pandemic, and care providers had to rely on creative problem solving to find innovative ways to support resident care throughout this crisis. This project focuses on identifying multiple areas across long-term care, where unique ideas, accelerated by the pandemic are improving resident quality care. Identifying and sharing multiple positive innovations that have emerged from COVID-19 will help to increase morale and overall will lead to quality improvements throughout long-term care. Following training on research ethics and interviewing techniques, University of Wisconsin-Eau Claire health care administration program residency students collected data about facility and staff characteristics at 40 skilled nursing facilities. They conducted interviews with the nursing home administrator, director of nursing, food/nutrition director, director of social services, and therapeutic recreation director, asking about beneficial ideas that emerged during COVID that they believe can and will continue. A thematic analysis yielded a list of key areas and a variety of both common and unique exemplars that could be considered for widespread adoption. Unique innovations that emerged from the pandemic are shared and can be utilized throughout long-term care to improve operations and resident care.

Materials Science and Biomedical Engineering

Improving Diagnosis of Kidney Cancer Using Infrared Spectroscopic Imaging

Blake Mathisen, Mikayla Hady, Leah Rook, Zach Caterer
Faculty Mentor/Collaborator(s): *Michael Walsh*

Infrared Spectroscopic Imaging has been shown to be a powerful approach to rapidly image human tissue biopsies to identify biochemical signatures associated with disease outcome. In this study we have applied two types of IR imaging to distinguish between two types of kidney cancer, chromophobe and oncocytoma. These two cancers represent a very difficult problem for the medical community to diagnose as the clinical symptoms are similar and they look almost identical to the experience pathologist. Definitive diagnosis between the two types is critical as the treatment options and prognosis for these two kidney cancers are very different. In this study we demonstrated that tradition IR imaging using a Fourier Transform based approach could allow for excellent objective diagnosis of these cancers. A newer faster laser-based approach which has potentially better applicability for clinical practice also demonstrated classification between the two groups. A comparison of the results between the two imaging tools will be compared and contrasted. Furthermore, we will present some new results about how kidney cancer can be effected by the diabetic status of the patient.

3D Printing to Enhance Patient Outcomes for Mini-Thoracotomy Aortic Valve Replacements and Mini-Mitral Repairs

Saige Tichy, Maya Frodl, Lauren Glenna
Faculty Mentor/Collaborator(s): *Douglas Dunham*

Aortic valve replacement (AVR) was established in the 1960's and has become a routine therapy to treat patients with severe aortic valve dysfunction. AVR is usually performed using a full sternotomy and

cardiopulmonary bypass support. Since the late 1990's, minimally invasive procedures have been developed for aortic valve surgeries, such as the mini-thoracotomy AVR. These less invasive procedures claim reduced postoperative complications, shorter lengths of stays in the hospital, and lower mortality. This project will provide the 3D printing capabilities needed to investigate if using 3D printed anatomical models result in better patient outcomes for mini-thoracotomy AVR surgery. The 3D printed models will also be used for educational purposes with providers at Mayo Clinic. For selected patient cases, the Mayo clinician will provide UWEC researchers DICOM files for segmentation and 3D printing. In collaboration with the clinicians, the UWEC research team will perform the segmentation and provide the physical 3D anatomical model. Ultimately, the Mayo Clinic collaborators will evaluate the effectiveness of using the 3D models in patient outcomes as well as patient education on the procedure.

Design of Custom N95 Face Masks

Zachary Fellenz, Cheyanne Wade, Kylah Krause
Faculty Mentor/Collaborator(s): *Douglas Dunham*

In this project, we examine how individualized N95 level face masks could be produced for at-risk individuals such as physicians, children, and the immunocompromised. In creating these masks, we strive for a custom fit to an individual's face that will induce a tight seal and as a result produce a more efficient filter. In creating the custom masks, we utilized an Einstein face scanning software that allowed us to scan an individual's face and upload the scan in a 3D printing software such as SolidWorks. After creation in SolidWorks, the part was uploaded to a 3D printer to create the unique framework for the mask seal. After printing, an N95 mask/N95 material was engineered over the framework producing a tight seal and filtering system that can be worn comfortably by the individual. This research is aimed at protecting those at-risk individuals aforementioned, while providing the user with better filtration and unique comfortability.

FDM 3D-Printed 17-4 PH Stainless Steel: An investigation into Its properties, Behaviors, and Potential

Sterling Kleist
Faculty Mentor/Collaborator(s): Douglas Dunham, Anthony Wagner

The potential of FDM (Fused Deposition Modeling) 3D-printed 17-4 PH stainless steel with Virtual Foundry Filamet is being investigated with the goal to achieve tensile, compressive, and sheer strength qualities of cast 17-4 PH stainless steel. This is done by extruding a 17-4 PH/PLA composite filament through a Prusa MK3S FDM 3D printer, debinding and sintering the prepared test specimens through a programmed muffle furnace and testing the finished steel through means of hardness and tensile strength, as well as optimizing the specimens through void space reduction. Currently, attempts at sintering have reached maximums of 1130 °C and 1232 °C over a hold time of 5 to 6 hours with the comprehensive process taking a total of 28 to 35 hours, with variations in processing due to the limitations of 2 separate Thermo Scientific Lindberg Blue M furnaces. Cross-sectional observations suggest that the sintering procedure may need to be longer and hotter to achieve uniform heat penetration. Rockwell hardness testing has also been conducted, though without comprehensive and thorough sintering indentations collapse almost immediately. Research on similar processes suggests that smaller parts and hotter temperatures increase part performance in all fields, including near-theoretical density of cast steel. Further research is needed to achieve useful specimens that can be tested.

Compassion Quotient Survey: The Road Map to the Compassionate Ideal

Annabelle Howat, Hannah Peroshek
Faculty Mentor/Collaborator(s): *Douglas Olson*

The long-term care environment can become business-driven and at times has lost it's focus on the quality of life and compassion towards residents. If long-term care focuses more on a compassionate environment, then residents and staff may have more positive quality outcomes. There is not currently a sufficient tool to measure a facility's compassion levels. As a result, Vivian and Mary Tellis-Nayak created a tool to both encourage and measure compassion in long-term care facilities. Residency students, as part of UW-Eau Claire's Health Care Administration Department conducted surveys and interviews with management members in 54 long-term care facilities to assess this tool. These surveys included five components of compassion. The qualitative and quantitative data gathered was analyzed to confirm established aggregate themes. Respondents had similar views of defining compassionate care and service processes including positive interactions, having a supportive environment, and staff being understanding of all situations. Facilities also mentioned factors which prohibited a compassionate environment. The results of the interviews and survey demonstrated that the tool helps promote compassionate practices. Given the feedback, certain aspects and factors were consistent and we can suggest how to increase awareness of the need to improve compassion practices.

Development of Biocompatible Surgical Foam for Utilization in Tumor Ablation

Drew Smith, Grace Cunningham, Marshall Apps, Kira Haus
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

In collaboration with Mayo Clinic Health System, undergraduate researchers at UW-Eau Claire have worked to produce and characterize a viable foam for utilization in tumor ablation procedures. Ablation is a minimally invasive surgical cancer treatment that uses a microwave probe to destroy specifically targeted tissue. Currently, saline and carbon dioxide are used to separate surrounding healthy tissues and prevent unnecessary damage. These materials are less than ideal as they do not maintain contact with the target tissue due to gravity. A biocompatible foam has been prepared and tested to address the drawbacks of saline and carbon dioxide. The stiffness and stability of foam as a function of time have been determined. The success of the lab tests has resulted in the advancement of the investigation; the materials have been successfully tested in vivo, and the process for testing in human patients has been initiated. Further research goals include expanding characterization of the foam using rheology and pendant drop tensiometry so as to quantify data for viscosity and elasticity, surface tension, and interfacial tension for peer-reviewed publication. Development and testing of the biocompatible foam aim to achieve significantly improved patient outcomes for ablative procedures.

Synthesis and Characterization of Stimuli-Responsive Polymers for Architectural Coatings via ARGET ATRP and Rheology

Kaylee Erickson, Hunter Koltunski, Carl Lundgren
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

The primary focus of this project is to conduct fundamental research on novel stimuli-responsive polymers, or smart polymers. These polymers can change physical properties in response to external stimuli such as temperature or pH. The goal of developing these novel polymers is to prevent particle aggregation in architectural coating formulas to reduce the number of particles needed to reach desired

opacity. The polymer in focus is polyethylene glycol (PEG)-block-poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA), or PEG-PDMAEMA block copolymers. The polymers are synthesized in various target block ratios and molecular weights using Activator ReGenerated by Electron Transfer Atom Transfer Radical Polymerization (ARGET ATRP). To confirm synthesis, the polymers are characterized using Nuclear Magnetic Resonance Spectroscopy (NMR) to confirm the structure and Gel Permeation Chromatography (GPC) to determine the molecular weight and dispersity. A Discovery-HR-2 hybrid rheometer is used to find optimal polymer concentrations to achieve ideal viscosity and titanium dioxide particle dispersion, which is a method called demand curves. High-shear testing is also conducted to see how the viscosity of the suspensions change when subjected to high-stress applications. This research could benefit the architectural coatings industry by using less particles in manufacturing, reducing environmental impact.

Characterizing Smart Polymers for Use in Architectural Coatings

Kai Olson, Cavan Callahan, Santiago Tzintzun
Faculty Mentor/Collaborator(s): *Elizabeth Glogowski*

Our research focuses on the synthesis and characterization of the behavior of smart polymers for use as titanium dioxide dispersants in architectural coatings such as paints. Smart polymers change their properties when exposed to different conditions, such as temperature, pH, and concentration. Smart polymers can be characterized and tested using a variety of methods. Pendant drop tensiometry (PDT) measures the interfacial tension between two immiscible liquids. Ultraviolet Visual Spectroscopy (UV-Vis) measures how light is scattered by a sample and identifies its cloud point, the temperature at which the polymer switches from transparent to cloudy. Rheology measures the time and temperature dependent behavior of polymers and indicates under which pH and temperature conditions behavior may switch between a viscous or elastic response. Polymers were characterized to identify how cloud points and interfacial tension changed with polymer concentration, pH, and polymer composition. Viscoelastic testing was done to measure changes in modulus due to gelation above the cloud point. By characterizing smart polymers, we can identify trends in their properties that indicate their viability as dispersants for applications in architectural coatings.

Recovery of Gold from Nanoparticle Waste

Sarah Landeau, Bradley Maes, Levi Svaren
Faculty Mentor/Collaborator(s): *Jennifer Dahl*

Nanoparticle research is a widespread field of research; however, only a fraction of synthesized nanoparticles are deployed for secondary applications, creating an abundance of nanoparticle waste. Failure to use nanoparticle-specific waste treatment can lead to unintentional atmospheric release of powdered solid waste, and solution phase waste is an intractable wastewater contaminant. Aside from the environmental impacts, untreated waste also disposes large amounts of gold, an expensive material. Having an effective method for recovering the gold from the waste will be economically beneficial as it will save significant amounts of money by eliminating the need to frequently purchase new gold. A variety of methods to recycle multiple forms of nanoparticle waste are described. The effectiveness of the different methods is examined by looking at the percentage of gold recovered. The poster will also describe our future goals for the project, including evaluating different possibilities for measuring the amount of gold recovered.

Updating and Upgrading a LabView Furnace Control Interface

Coleman Maegi
Faculty Mentor/Collaborator(s): *Matthew Jewell*

In 2015 a custom LabView furnace control interface for a three-zone tube furnace was built at UW-Eau Claire. Over time, the code from 2015 has become outdated and needs to be compatible with the newer versions of LabView and Windows. Functionality issues with the previous code have also been identified. In this project we have updated the interface and background code to modern standards and have also implemented new user features such as a fill feature that allows the user to fill in temperature setpoints and time segments for one zone and copy them over to the other two zones, eliminating redundant data entry. We are also investigating a data screen to display the current temperature, setpoint and power output for all the zones in real time. Finally, we are implementing a method to collect all the data from the furnace run and put that data into a file such as a CSV or Excel document. In total, this upgrade provides greater functionality and stability, enabling users to more easily set up, run, and record their furnace heat treatments. Acknowledgements: This work has been supported by the Materials Science & Engineering Center at UW- Eau Claire.

Analysis of Bi2212 Superconducting Filament Structure using Machine Learning Algorithms

Reed Oberg
Faculty Mentor/Collaborator(s): *Matthew Jewell*

With the increasing interest in developing high temperature superconducting magnets, the material $Bi_2Sr_2CaCu_2O_{8-x}$ (Bi2212) has attracted interest due to its very high upper critical field values. However, the wires created using the powder-in-tube method generate a branching crystalline structure that connects wire filaments together during the heat treatment process, which has been suggested to have negative impact on the performance of the wires in a magnet conductor. Furthermore, there is currently no efficient method to analyze these wire filaments for the purpose of quality control. In this project, we created a machine learning algorithm that identifies pixels from cross-sectional wire images as either conjoined, individual, or background in nature. The model takes images manually labelled with the proper pixel categories and learns from them, allowing the model to subsequently classify filaments without human intervention. Overall, the model runs with an averaged accuracy of 94.1% for image pixels, and 65.8% for filament pixels. With this model, a metric for measuring the quality of Bi2212 wires can be developed and may be used to streamline the quality control process of Bi2212 wire production. Acknowledgements: This research was supported by the U.S Department of Energy, Office of High Energy Physics, Award DE-SC0020984, and by the Materials Science & Engineering Center at UW-Eau Claire.

Analysis of Filament Homogeneity in Composite Bi-2212 Wires

Evan Coursin, Kate O'Brian
Faculty Mentor/Collaborator(s): *Matthew Jewell*

$Bi_2Sr_2CaCu_2O_{8-x}$ (Bi-2212) is a superconductor capable of producing large magnetic fields for advanced magnet systems. However, fluctuations in the size and shape of Bi-2212 filaments in a composite wire can affect the flow of electric current in the wire and therefore the magnetic field produced. For this project, sample Bi-2212 wires were sectioned and imaged at several depth levels to assess the longitudinal

homogeneity of the filaments. Image analysis using ImageJ was then used to threshold and mask the images, and then layer them on top of another to align the filaments. The changes in filament height, width, and area change through the layered images were observed and analyzed. General qualitative analysis suggests individual filaments can experience large changes in their shape, though more quantitative analysis is needed to determine the magnitude of these changes.

Effects of Thermal Cycling on Wire Movement in ITER Nb3Sn Superconductors

Jack Swanson
Faculty Mentor/Collaborator(s): *Matthew Jewell*

Superconductors are materials that can carry an electric current with no resistance, which is very useful for generating high magnetic fields. In the ITER fusion reactor, these high fields are used to contain the plasma that carries out the fusion reaction. One problem with this system is as the reactor goes through thermal and electric cycles it causes degradation of the Nb3Sn superconducting wires within the cable-in-conduit conductor (CICC) which degrades the performance of the magnet. Using X-ray tomography, Manchester University imaged a Nb3Sn CICC during thermal cycling from 77K to room temperature, and UWEC analyzed the wire movement during the cycling using the FIJI software. The wires movement during cycling helps us to understand the cause of the degradation and improve future CICC designs to improve the reliability of future conductors.Acknowledgements: This work was financially supported by the ITER Organization, contract IO/18/CT/4300001665 and benefited from the support of the Materials Science & Engineering Center at UW-Eau Claire.

Mechanical Disassembly and Image Analysis of Degradation in ITER Cable in Conduit Conductors

Cheyanne Wade, Cameron Johnson, Zachary Fellenz
Faculty Mentor/Collaborator(s): *Matthew Jewell*

The goal of this research is to use image analysis techniques and manual disassembly to understand the performance degradation of electromagnetic cycles on superconducting cable-in-conduit conductors for fusion reactors that contain brittle Nb3Sn superconducting filaments. We wish to identify a set of ideal operating conditions that will minimize the mechanical and electrical degradation of the superconductor. In this study we are comparing low field zone and heat treated with those that have undergone electromagnetic testing and in which performance degradation has been occurred. Our process involves two main tasks: (1) to mechanically disassemble the conductors and look for visual evidence of wire and filament damage, and (2) to look for wire and filament degradation during testing by doing digital image analysis on transverse cross-sections of the conductor. Our results show that scratches on the external surface of the wires lengthen after testing, indicating that the wires are moving relative to each other during the test. Further, the cable shifts within the conductor towards the high Lorentz force direction, loosening the wires on the low-pressure side, which subsequently bend and are damaged. These analyses will allow us to propose design improvements for future conductors and help specify a safe operating condition that minimizes damage.

Nanoindentation and Nanoscratch Testing of REBCO Superconducting Thin Films

Jacob Dick
Faculty Mentor/Collaborator(s): *Matthew Jewell*

Rare-earth based cuprate (REBCO) superconductors are a promising magnet conductor for fusion reactors and other high-field magnet applications. However, the material is challenging to fabricate in a uniform way, so in this project we assess the mechanical differences between different types of fabricated REBCO tapes. This is done using two methods. The first method tested the hardness of each of three different tapes using nanoindentation. On two samples, we identified a bimodal distribution of hardness behavior that correlates with a dual-phase structure we observe by microscopy. The second method, nanoscratch testing, was performed on "buffer" samples to understand how these substrate layers differ in mechanical performance with processing variation. The results show a difference in both friction and wear rate among the samples. Both of these tests provide promise for new in situ characterization approaches to catch processing or quality defects during REBCO tape manufacturing. Acknowledgments: This work was financially supported by the U.S. Department of Energy (DoE), Office and High Energy Physics (OHEP), award DE-SC0020984, and benefited from the support of the Materials Science & Engineering Center at UW-Eau Claire.

Ab Initio Molecular Dynamics Simulations of Amorphous Metal-Polysulfides as Cathode Materials for Lithium Batteries

Jinkai Si, Meg Olson
Faculty Mentor/Collaborator(s): *Ying Ma*

Lithium-sulfur batteries offer a few advantages, including high energy density and low cost, compared to our current battery technology. However, the polysulfide shuttle effect, which is caused by various polysulfide intermediates formed during charging and discharging, hinders their commercial application. It has been shown that the formation of polysulfides can be hindered by amorphous metal sulfides, although a fundamental understanding is lacking. In this work, ab initio molecular dynamics simulations have been performed to investigate the structure and kinetics of several amorphous metal sulfides. A simulated melt-quench process was used to generate the structures of amorphous molybdenum and titanium sulfides with different sulfur concentrations. Different numbers of lithium ions were added at the cathode/electrolyte interface to simulate the discharging process, based on which atomistic mechanisms regarding the formation and diffusion of polysulfides have been revealed. Insights obtained from this work could help to develop new strategies to effectively inhibit the polysulfide shuttle effect, thus promoting the commercialization of lithium-sulfur batteries.

Computational Screening of Cathode Materials for Lithium-Ion Batteries

Ben Georgeson, Kellan Michaelson, Maoda Ge, Jinkai Si
Faculty Mentor/Collaborator(s): *Ying Ma, Paul Thomas*

Advancement of lithium-ion battery technology has remained stagnant despite tremendous efforts in improving the cathode material, specifically with increasing energy density. Research has shown that alternative materials can be developed with high energy density but limited cycling capability. This project will use theoretical quantum mechanical calculations to validate energy density of the selected

alternative materials. Materials to be investigated include metal fluorides, sulfides, nitrides, and oxides. Materials selection will produce an energy density greater than 260 Wh/kg (936 kJ/kg), the typical energy density of modern Tesla vehicle batteries. Further investigation will be completed to consider cost of selected materials. These results will improve knowledge of lithium-ion battery technology, advancing fields such as electric vehicles, cell phone batteries, and storage of renewable energy.

Computational Screening of Organosulfides as a New Class of Cathode Materials for Energy Storage

Ziyan Yang
Faculty Mentor/Collaborator(s): *Ying Ma*

Elemental sulfur is a promising cathode material for energy storage devices because of its exceptionally high energy density. However, lithium ions react with octasulfur rings in elemental sulfur to form various lithium polysulfides, giving rise to the notorious polysulfide shuttle problem. Recently, organosulfides, a new class of cathode materials with a relatively short sulfur chain stabilized by various functional groups, have been proposed, although their energy densities are much lower than that of sulfur. In this project, computational screening of organosulfides with varying sulfur chain length and different functional groups were performed. The open-circuit voltage and the energy density were determined using first-principles calculations based on the density functional theory. An optimal organosulfide with the highest energy density was identified, and a possible synthetic route was proposed. Our results could lead to the development of a commercially viable lithium battery with increased energy density and lower cost.

Exploring Policies to Promote High-Performance Computing in Post-Pandemic Undergraduate Education in Wisconsin

Molly Mohr, Isabella Doss, Jordan Herbert
Faculty Mentor/Collaborator(s): *Ying Ma, Sudeep Bhattacharyay, Rahul Gomes*

The COVID-19 pandemic has challenged higher education institutions across the world to maintain the quality of education and fulfill their mission. Notably, classes and research projects that involved high-performance computing (HPC) have been extremely successful in minimizing the impact of the pandemic. While HPC offers incomparable advantages in terms of preparedness for a public emergency, it is also becoming increasingly important in virtually every branch of social and natural sciences. Our scholarly goal for this project is to develop new policies for the UW System that will instantiate a shared model of HPC resources within undergraduate education across UW campuses. Our research methods include exploring global policies regarding HPC resources, surveying and interviewing UW students and faculty as well as industries, analyzing the survey and interview data, and producing policy recommendations based on our findings. Through this repository, we hope to develop an intuitive integration that will be beneficial for classroom use and data research and will also contribute to the progress of the community and local industries in Wisconsin.

Mathematics

Trading Strategies Based on Fixed Investment Plan, Market Signals and Priceprediction using Deep Learning Approach

Qianyu He, Zhongzheng Zhou, Haitian Wu
Faculty Mentor/Collaborator(s): *Wufeng Tian*

Digital cryptocurrency first emerged in 2009 and is a currently thriving open-source community and payment network. Its ecosystem is gaining lots of attention from business, consumers and investors. In this paper, we initially applied two strategies that are commonly in use in stock and cryptocurrency market, automatic fixed investment plan and trading at the ‘’Golden-cross” and ‘’Death-cross” points. We back-tested the market data from 09/16/2016 to 09/11/2021, the annualized rate of return generated by the automatic fixed investment plan, trading at ‘’Golden-cross” and ‘’Death-cross” strategy for gold are 10.1% and 10.68%. Then, we developed a third trading strategy based on the short-term market prediction using a Deep Learning model. The annualized rate of return generated by the automatic fixed investment plan, trading at ‘’Golden-cross” and ‘’Death-cross” strategy, trading based on short-term market prediction from a Deep Learning model for bitcoin are 10.1%, 98.77% and 128.18% respectively.

Comparison of Cost-Effectiveness of Wind and Solar Power on Generating Electricity in Wisconsin.

JunDa Zhao, Shi Qiao, Chengduo Gu
Faculty Mentor/Collaborator(s): *Wufeng Tian*

Global warming has emerged as a worldwide environmental concern since the pre-industrial era. Popularizing the application of renewable energy is imminent. Although being environmentally friendly, it should be cost-practical for the user as well. Our study focused on two types of clean and popular methods of generating electricity: Solar and wind. We compared the relative cost-effectiveness of the two methods working within time periods of 10, 30, and 50 years. We used corresponding formulas and applied various real-life factors for both methods to calculate the amount of electricity each could generate within the time periods, then constructed charts to demonstrate the comparison graphically. We have reached the conclusion that in general, applying wind power to generate electricity is much more efficient than using solar panels in Wisconsin. This might provide some insights on which method the state of Wisconsin should apply and develop in the future.

Examining the Hiring Challenges and Labor Force Shortage in Barron County, WI

Haitian Wu, Qianyu He, Geboli Long, Zhongzheng Zhou
Faculty Mentor/Collaborator(s): *Wufeng Tian*

Many local businesses in Barron County have been struggling with hiring individuals recently. To determine what factors cause the shortage of employees, we investigated the demographics, housing, transportation, and public safety of Barron County, and compared the data of Barron County with that of Wisconsin and the US. We found old dependency ratio at Barron County is too high, which directly results in the lack of labor. A solution to decrease the dependency ratio within a community is to promote immigration for younger people, maintaining and attracting younger generation to the community. Then, we analyzed the existing research data and concluded that household median income is highly correlated

with the ratio of gaining and maintaining young generation. The findings of this proposed research will help to direct the local business and government to areas of improving labor force participation and assist in guiding future studies and investigation if necessary.

A 3D Printed Arduino Powered Electronic Barth Sextic

Samantha Maurer, William O'Brien
Faculty Mentor/Collaborator(s): *Silviana Amethyst*

During the summer of 2020, two undergraduate students at the University of Wisconsin – Eau Claire researched icosahedron symmetries found within the Barth Sextic, an algebraic surface featuring 65 double points. The Barth Sextic light fixture used in the study combines art and mathematics; this is most noticeable with the physical model of the surface utilizing 3D modeling and printing, Arduino, and Neopixel Jewel chips. In addition, the students contributed to the code that powers both the controller and fixture. With the controller, individuals can interactively explore the symmetries, namely rotations and reflections, by influencing the presence of colored light within each of the double points.

Assembling Algebraic Surfaces

Caden Joergens
Faculty Mentor/Collaborator(s): *Silviana Amethyst*

Algebraic surfaces are interesting and beautiful objects. They describe sets of space where a system of polynomials vanishes. They are almost everywhere smooth and can have corners, cusps, self-intersections, and sharp points. When 3D printing such surfaces, the smooth places present no difficulty. Singularities are where the surface meets at a single point of no width, length, or height, occurring at all corners and crossings. This lack of dimensions at singularities presents inherent problems for creating 3D models which can be correctly printed. Past methods for preparing a model for printing have focused on global solidification; that is, applying a thickness to the entire model, forcing the singularity to appear as a smooth surface. This project aims to change the problem of solidification around nodal singularities from one of resolving internal geometry, to one of placing sockets and plugs at them. This will allow models to be printed in several pieces, saving plastic, and improving robustness. It will also create possibilities for electronic projects, puzzles, and toys.

Colored Triple Linking Number

Ethan Olerich, Ryan Gallagher
Faculty Mentor/Collaborator(s): *Christopher Davis*

In the 1950's Milnor introduced a powerful collection of tools, now called Milnor's invariants, to the study of link theory. Even the very first of these, called the triple linking number, has been the subject of fruitful and intense study ever since. Inspired by the work of Mellor-Melvin, which computes the triple linking number in terms of bounded surfaces, we present an extension of the triple linking number to colored links. A colored link is a link whose components have been decorated by colors. We apply this tool to generate obstructions to colored links bounding disjoint surfaces.

Analyzing Turning Points of the Airy Dynamic Equation via the Time Scale Calculus

Scott Lawton, Erin Coonen
Faculty Mentor/Collaborator(s): *Chris Ahrendt*

The purpose of this study is to identify and analyze behavior of turning points of the Airy Dynamic Equation, a discrete generalization of the classic Airy Differential Equation. Throughout the process, we appeal to the Time Scale Calculus, which allows for the unification of differential and difference equations. As a result, we are able to analyze the parameterization space and also describe the periodicity as well as other behaviors associated with various parameters in the discretization of the Airy equation. In this work, a brief introduction to the Time Scale Calculus and discretization methods will be provided.

Prediction of B-cell Antibody Binding through Statistical Analysis of Epitope Variables

Kate Mueller, Payton Reiner
Faculty Mentor/Collaborator(s): *Abra Brisbin*

With the rise of the COVID-19 pandemic, research and discussion regarding vaccine development has become extremely prominent in today's world. This has caused many to question the processes occurring behind developing new vaccines. In this project, we used R Studio to analyze different variables of antigen proteins to predict which variables may contribute most toward whether a peptide will bind with cell antibodies. With the data set of variables provided, as well as our own coded variables, we used both a logistic regression model and an XGBoost model to find that peptide size, position, and hydrophobicity are the most important variables for predicting antibody binding. We will also present results from applying our models to a data set of COVID-19 antigens.

An Actuarial Exploration of Fantasy Football Insurance

Ryan Fries
Faculty Mentor/Collaborator(s): *Herschel Day*

The fantasy sports market is a 20-billion-dollar industry that is still growing in popularity. Fantasy football is a major component of this market, consisting of weekly and season-long leagues where individuals draft a team of professional football players and then compete against other fantasy teams based on the performance of the players on their team. This project examined the pricing for a hypothetical insurance product that would provide season-long fantasy football owners protection against the risk of extended injuries on team performance. Mathematical tools such as multiple linear regression and simulation techniques were utilized to better understand the predictability of injury risk and to establish key pricing parameters. In the end, the product design and premium structure were employed to measure the potential profitability of the insurance using 2021 National Football League data.

Curriculum Development of Math 114: Calculus

Katherine Faris
Faculty Mentor/Collaborator(s): *Christopher Hlas*

The main purpose of the research project was to analyze the course data focusing on relationships between students' online homework and assessment data. During the Fall 2021 semester, online homework was collected via WeBWorK and assessment data were collected through six group quizzes and four individual examinations (including the final exam). Data were analyzed over winter break 2022 focusing on relationship between homework and assessments, if any. Result indicate that very few individual homework assignments had strong relationships to assessment data. This indicates areas to realign homework and assessment problems, but also may indicate a change of format for group quizzes.

Relating Local COVID Hospitalizations to Vaccination and Variant Stages.

Anna Zank
Faculty Mentor/Collaborator(s): *Jessica Kraker*

Since vaccinations for COVID first rolled out in December 2020, assessing the impact of vaccinated individuals on health outcomes (such as COVID hospitalizations) has been imperative. A prior-year COVID-tracking time-series analysis did not have sufficient vaccination cases to integrate. Since COVID vaccinations were subsequently offered in "stages" (according to various risk factors of recipients), the primary focus of this project is to assess the changes in hospitalizations across both the vaccination and variant stages. Wisconsin statewide and county-level data is obtained from the WI Department of Health Services, available on their public data pages to support community decisions. We identified different vaccination stages as determined by policy dates and lag times. The proportional distribution of Covid-19 cases and hospitalizations across age groups is visualized by split bar charts. We compared and assessed how those distributions changed between vaccination stages. As part of the past study, a lag between COVID-19 positive tests and hospitalizations was estimated. Relating the hospitalization count, lagged in time, to the count of positive tests allows us to estimate rates of hospitalization from COVID and to use data-driven identification of "stage" changes (potentially corresponding to vaccination or variant changes).

Pretty Peculiar Properties of the Fibonacci Sequence under Various Moduli Values

Alyssa Franks, Javier Sanchez,
Faculty Mentor/Collaborator(s): aBa Mbirika

We explore properties of the Fibonacci sequence modulo m and its subsequences. To explore these properties, we collected data on the sequence using the software package Mathematica. We attempt to categorize certain properties that arise for classes of various m values. To aid us in this categorization, we use generalizations from aBa Mbirika, Dan Guyer, and Miko Scott's investigation of the Fibonacci sequence modulo 10.

Recovering Signals with Irregular Sampling
Huston Wilhite
Faculty Mentor/Collaborator(s): *Sam Scholze*

In order to store and transmit a continuous signal, it is often sampled at discrete points. These discrete points may then be used in order to reconstruct the original signal, often using dual frame pairs. However, many reconstruction algorithms assume the signal is sampled at regular intervals, which may not be a valid assumption in practice. Previous work as been able to reconstruct such signals under certain conditions by erasing the data sampled at non-regular intervals, but this strategy fails when many points have been sampled irregularly. We develop an algorithm to achieve (theoretically) perfect reconstruction of a signal which has been sampled at nearly regular intervals without erasing any data points.

McIntyre Library

A Framework for Appraising University Affiliated Web Content
Brice Vircks
Faculty Mentor/Collaborator(s): *Gregory Kocken*

Institutional functional analysis is the framework introduced by Helen Samuels used by archivists to appraise the records of institutions. This project aimed to apply the archival appraisal methodology of institutional functional analysis to web archiving practices at the University of Wisconsin-Eau Claire Special Collections and Archives. Prior to this project, little research has been conducted applying appraisal methodology to web archiving practices. This project was successfully able to apply functional analysis to archiving university websites and divided their functional purposes into two categories, culture and authority. Websites designated as holding cultural relevance hold informational value regarding the actions and activities of an institution and its people. Websites designated as holding authoritative value present evidence of institutional governance. This project faced limitations in fully applying appraisal methodology due to the use of third-party applications to archive websites and social media webpages. This is due to web archiving's reliance on pre-existing tools that are unable to bypass the security of social media websites that limit the ability to capture social media content. Despite this setback this project was able to modify and apply functional analysis to match the requirements of documenting past, current, and future UWEC websites.

Racism in Research Methods: Creating an Anti-Racist Research Guide
Anthony Wallace, Sara Nagel
Faculty Mentor/Collaborator(s): *Kate Hinnant, Liliana LaValle*

The purpose of this project was to investigate the theory and methods of anti-racist research practices related to disciplines at UW-Eau Claire and produce a library guide for students and faculty. Anti-racist research practices consider and try to counteract the effects of historical and contemporary racism on the design and outcomes of research projects. While scientific racism has been well-documented and anti-racist methods have been advocated in scientific and medical fields, they have also been applied in humanities, education, and business fields. We first reviewed research on anti-racist research methodology, and then developed the guide, selecting examples to illustrate anti-racist research practices

in every field. Through the guide, we hope to reinforce that research design and methods are not neutral but require scrutiny to avoid reinforcing traditions and practices that favor white western hegemony. Our presentation will include a poster and demonstration of the guide.

Music and Theatre Arts

Creating Musical Mood Directive Recording Files
Tessa Ferry
Faculty Mentor/Collaborator(s): *LeeAnna Rasar*

Tessa Ferry worked with Abbie Sonstegard, Jason Armstrong, Amber Atchison, and Lee Anna Rasar to create and record files of musical mood directive playlists. Ferry began working on the playlists during Fall 2020 with Faculty Mentor/Collaborator(s) Rasar and then worked with Sonstegard and Rasar during Spring 2021 to further create 15 sets of playlists for musical mood induction through a university grant. During Summer 2021 she worked with Armstrong and Atchison and Rasar on this grant to make and evaluate recordings of the playlists and to make revisions as needed for mood change effectiveness. Neuroscience research was used to sequence songs for each playlist to initially match negative feelings associated with the COVID-19 pandemic and then emotionally redirect the listener to a more positive mood. Musical elements and properties such as tempo, key, orchestration, dynamic level, expectations, and more were used to create mood directive effects.

Developing Learning Packets for the Influence of Music on Behavior
Tessa Ferry, Lauren Casey
Faculty Mentor/Collaborator(s): *LeeAnna Rasar*

Tessa Ferry and Lauren Casey worked with Lee Anna Rasar by creating learning packets and assessing materials to use for the course Influence of Music on Behavior which was being taught for the first time exclusively to non-majors. Assessment areas include teaching delivery modes using lecture/demonstration, videos, text readings with questions, and integration of graphics into the presentation of course materials and the assessment modes used for assignments/quizzes. Types of structures used for teaching delivery and for student assessment are being evaluated for their effectiveness in student learning to determine what structures are the most successful.

UW – Eau Claire Bands – A Centennial Celebration
Angela Klinkner, Lauren Ische
Faculty Mentor/Collaborator(s): *John Stewart*

The UW – Eau Claire Band program started in 1922 as the Normal Band, and in 2022-2023 the University will celebrate the 100th Anniversary of the bands on campus. The purpose of this historical study (still in progress) is to learn about and document the rich history and development of the bands at UW – Eau Claire. Researchers are working with University Archivists to document the development of the band program, including cataloguing performed repertoire by the Concert Bands, Jazz Ensembles, and Marching Band, locating and digitizing audio and video recordings of performances, documenting programming trends, and documenting the rich history of guest artists such as performers, composers, and conductors. This research is guided by the following questions: In what ways has the UW-Eau Claire

Band Program developed since its inception in 1922? Who are the guest artists (composers, conductors, and performers) that have collaborated with the University Bands since 1922? What repertoire has been performed and premiered by the University Bands?

Origins of Folk Songs Used in the Music Classroom

Haley Corcoran, Ariana Carlson
Faculty Mentor/Collaborator(s): *Laura Dunbar*

The goal of our 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, inappropriate origins, or unnecessary gendered language 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. We hope to continue this research, as there are so many folk songs yet to be researched.

Oboe For Everyone: Developing a Virtual Course of Study for Beginning Oboists with Inclusive Repertoire

Peyton Tohulka, Lauren Ische, Bailey Dean
Faculty Mentor/Collaborator(s): *Christa Garvey*

The oboe has a specialized pedagogy that must be presented correctly for a beginner to progress effectively. In a standard music education curriculum, a program director may not have the knowledge necessary to facilitate a beginning oboist. For those students who wish to receive further instruction—such as finding a private lesson teacher—there are several possible barriers, such as finances, commute time, availability of an oboe specialist, etc. The UWEC Oboe Studio has developed an online, graduated system of study for the beginning oboist that is accessible to all through the instructor's "Oboe for Everyone" website. By analyzing other public-access oboe resources and pulling from the co-investigators' pedagogical experience with beginning oboists, the team developed instructional lesson plans that took the form of video presentations. These videos then informed the organization of the website so that there is a natural progression between topics and a clear guide to finding other useful resources. While the website is still being updated, it is an important, consolidated repository for specialized information regarding the oboe. The lessons, extra resources, and ease of navigation makes the website usable for oboe students and teachers alike. The project consisted of 5 parts: research, lesson planning, video demonstration recording/writing stage, website building/editing, and final reflections.

Nursing

Evidence-based Strategies for Standardized Exam Remediation in Nursing: An Integrative Review

Haley Bradley, Kinley Regan, Regan Thomas, Alicia Sund (Rita Donahue – Alumnus)
Faculty Mentor/Collaborator(s): *Jeanette Olsen, Dalete Mota, Catherine Wildenberg*

Many nursing programs utilize standardized exams to prepare students for taking the national council licensure exam (NCLEX), taken upon graduation to become a registered nurse. Scores on these standardized exams can indicate how well a student will perform on the NCLEX and if additional help is needed. Some programs require students to remediate and retake the standardized exam to improve performance. Remediation activities vary from textbook readings to practice questions on missed content from the exam. Research indicates that scores usually improve more among students who do remediate versus those who do not. Yet, literature is unclear regarding which remediation strategies lead to the best outcomes. Our integrative review of literature aims to find standardized exam remediation strategies and best practices that are most effective for helping students improve scores on standardized exams and pass the NCLEX. Six databases were searched using a combination of search terms. After removing duplicates and completing a three-phase screening process, we had a final sample of 26 articles. Extracted data were placed into an evidence table and analyzed for themes. Once completed, we anticipate results will provide guidance to nursing programs regarding remediation practices that enhance student performance on future exams.

HESI Standardized Nursing Exam Remediation: A Program Evaluation Project

Kinley Regan, Haley Bradley, Regan Thomas (Nicole Willmus, Rita Donahue—Alumni)
Faculty Mentor/Collaborator(s): *Jeanette Olsen, Dalete Mota, Catherine Wildenberg*

The UW-Eau Claire nursing program, like many nursing programs, utilizes standardized exams to prepare nursing students for the National Council Licensure Examination (NCLEX). The NCLEX is a licensing exam students must pass after graduation to become a registered nurse. A variety of exam companies are available. The UWEC nursing program elected to use Health Education Systems Incorporated (HESI) exams. The purpose of this project is to conduct a remediation-focused evaluation of the HESI standardized exam program implemented in the UWEC Nursing Department in Spring 2020. A Qualtrics survey was administered to current UWEC pre-licensure students and recent alumni to gather feedback on the remediation process including benefits, barriers, and facilitators. Archival de-identified exam data was collected from Spring 2020 through Fall 2021. The research team is currently analyzing the survey and the exam data results descriptively using SPSS. Open ended survey comments will be analyzed for themes. Implications for the remediation process will be offered once data analysis has been completed. We anticipate these findings will be used to generate recommendations that could inform the Department of Nursing's decision-making regarding the HESI policies and the remediation process.

Attitudes and Perceptions Toward COVID-19 Vaccines among the Somali Population in Northern WI

Ellie Decker
Faculty Mentor/Collaborator(s): *Mohammad Alasagheirin, Dr. Mary Canales*

Title: Attitudes and perceptions toward COVID-19 vaccines among the Somali population in northern WI.The study's aim was to gain an understanding of vaccine acceptance and/or hesitancy within the Somali population. Vaccination rates are significantly lower among Black and Hispanic communities; those with lower educational levels; and those living in rural areas. This study's purpose was to explore a northern Wisconsin Somali community's attitude toward COVID-19 vaccines and examine factors associated with vaccine hesitancy and acceptance. Through qualitative methodology employing focus groups for data collection and inclusion of Somali interpreters, we explored the viewpoints of individuals within the Somali community regarding these topics. Focus group interviews were transcribed verbatim. The research team met regularly to identify themes. The overarching theme was Protecting self, others, and the community. Most participants accepted vaccinations, and the COVID-19 vaccine specifically, to protect themselves, others, and their community. Trusting local messengers including healthcare and public health personnel, valuing collective memory associated with previous communicable diseases, religious support of actions, and following protection advice all supported vaccine uptake. This study supports further research and methodologies to increase community outreach and establish trust between community members, healthcare workers, and public health personnel to promote public health and safety.

Physics and Astronomy

Analyzing the Response of a Gamma Ray Spectrometer

Sarge Baker, Samantha Donhowe
Faculty Mentor/Collaborator(s): *Lyle Ford*

We experimentally analyzed the internal components of an old gamma ray spectrometer. The NaI(TI) spectrometer was manufactured in 1979 and all of its internal components are original. We were unable to open the device to examine its internal components without destroying the detector. Therefore, we determined the state of the scintillator through indirect means and found that there was no evidence of cracks or impurities in the NaI(Tl) crystal. Knowing the detector is free of internal defects will allow future use of the detector without concern about its reliability.

Effectiveness of Programming to Enhance Research Mentoring for Diverse Students

Ivy Jones
Faculty Mentor/Collaborator(s): *Matthew Evans*

Mentoring diverse students has become an important topic at colleges supporting equity, diversity, and inclusion (EDI). A summer pilot program, EDI - Mentoring Diverse Students in Faculty/Student Collaborative Research Community of Practice, was created to help mentors improve their mentoring skills for diverse populations through readings, discussions, and reflections. This study looks at post-

program implementations through surveys, and the effectiveness of the techniques presented, as measured by the mentees and mentors. We will offer insight into the effectiveness of the pilot program, showing the methods that enhanced mentee experiences and outcomes.

Political Science

Germany: Soft-Power Diplomacy in a Changing International System

Isaac Swenson
Faculty Mentor/Collaborator(s): Damir Kovačevič

This project will investigate how Germany navigates the international system. The project will address the question of "how doesGermany remain a great power state within the international arena while using soft power methods?" In other words, how is Germanythriving as a great power state in the face of conventional wisdom (i.e. utilizing soft power tactics over hard power tactics)? Inaddition, the project will also examine possible shifts and changes occurring in the international system. The topic is important becauseexamining a possible future of politics enables one to make predictions about the world. Germany challenges preexisting notions ofhow a state "should" thrive and gain power: diplomacy, persuasion, and trade over military might (i.e. weapons and alliances).

The Impact of Population on Political Status of the Sámi in Norway, Sweden, Finland, and Russia

Tate Williams
Faculty Mentor/Collaborator(s): Damir Kovačevič

The growth in political agency available to Sámi peoples in the Sápmi region, encompassing the territory of Norway, Sweden, Finland, and Russia, since the 14th century has proven uneven. Previous research has explained the status of Sámi through the lens of domestic politics of each state or attributed loss of agency to nomadic/semi-nomadic cultures. This fails to incorporate the importance of population and population density within each Northern state. The status disparity between the four states and their Sámi populations is caused by national government form and domestic Sámi population. Population data from the three national Sámi Parliaments, legislation from four national governments and local policy of various regional governments will be analyzed to display the differing status of Sámi across the region from delineation of national borders in the 14th century to the age of globalization. The findings demonstrated herein will show the value of population and form of national government within the context of Sámi political status.

The Past, Present, and Future of the First Amendment and Hate Speech: An Analysis of the Fighting Words Doctrine and Incitement

Hannah Temes
Faculty Mentor/Collaborator(s): Eric Kasper

With rising cultural tensions in the United States, hate speech and hate crimes have also increased. Some tensions today surround the reactions of both the supporters and dissenters of the Black Lives Matter movement. Pertinent cases on fighting words and incitement surrounding both Chaplinsky v. New Hampshire (1942) and Brandenburg v. Ohio (1969) are relevant to understand First Amendment

protections and limitations regarding hate speech. I looked at how Chaplinsky's Fighting Words Doctrine and the incitement test from Brandenburg can be applied to these tensions, particularly focusing on digital communications during the past three years. This analysis of the Fighting Words Doctrine and the Brandenburg Test gave a definition of fighting words and incitement to imminent lawless action, but more recent cases show how these definitions are slowly changing. The ages of these tests became apparent in my research, and caused me to question whether they should be reevaluated by the U.S. Supreme Court or whether the Court should create different tests altogether for this type of expression in the age of the Internet.

Freedom of Speech on University Premises in the Wake of the COVID-19 Pandemic

Annie Schneider
Faculty Mentor/Collaborator(s): Eric Kasper

This project aims to better understand First Amendment freedom of speech and assembly rights on public university campuses within the context of COVID-19 policies that have been executed by administrators across the country since 2020. Analysis was undertaken by exploring current U.S. Supreme Court First Amendment free speech jurisprudence and applying it to relevant policies in the University of Wisconsin System, including those implemented at the University of Wisconsin-Eau Claire; these policies encompass mask mandates, restrictions on gatherings/six-foot distance requirements, punishments for breaking restrictions, and requirements to sign a COVID pledge. A process of comprehensive archival research was undertaken, including examining past U.S. Supreme Court decisions and relevant secondary publications. In order to analyze the relevant COVID-19 policies, the Court's current understanding of time, place, and manner restrictions were considered, as well as the Court's compelled/symbolic speech tests established out of Tinker v. Des Moines, West Virginia v. Barnette, and Wooley v. Maynard. Due to the novelty of the present COVID-19 circumstances, current First Amendment case law in this context raises thought-provoking questions, including exposing gaps in the Court's precedents that the justices should address in future cases.

Public University Student Newspapers and the First Amendment

Anna Wendorff
Faculty Mentor/Collaborator(s): Eric Kasper

This project on "Public University Student Newspapers and the First Amendment" aims to expand upon previous constitutional law research to understand the question of free speech and free press rights of students in public university student newspapers. Research will focus on analyzing U.S. Supreme Court cases such as Hazelwood v. Kuhlmeier (1988), Rosenberger v. University of Virginia (1995), University of Wisconsin System v. Southworth (2000), Near v. Minnesota (1931), and others. Such case investigations help to further refine the discourse of student free speech and free press rights within public university newspapers, which is significant because of the implications for public university students, campus environments, and the future of professional journalism. There are student-run newspapers on college campuses across the country, and the limit to public university student expression is still being defined. Public university students must understand the extent of their rights so that they may freely express their views and learn how to use language to enrich journalism and report on campus activities. The primary methodology used in this research is archival, examining Supreme Court cases, lower court cases, and law review articles. Primary and secondary resources are researched through the Westlaw

database. Results include an advanced consideration of public university campus newspapers, free speech and free press rights of students, and relevant field interpretations.

The Constitutionality of Window Display Bans on Public University Campuses

Harry Mateski
Faculty Mentor/Collaborator(s): Eric Kasper

Throughout the United States, public university campuses have implemented policies that ban students from displaying items (e.g., signs, art, decorations, etc.) on dorm room windows and doors, with violations of such policies resulting in disciplinary action. Such policies, depending on how they are worded and enforced, raise the potential of restricting constitutionally protected expression. Recently, UW-Eau Claire implemented this type of policy. These policies raise an important question: When do public university policies that restrict student displays on residence hall windows and doors violate the First Amendment? This research project analyzes freedom of speech cases decided by federal courts in the United States to help better understand what the First Amendment requires for public universities. I conclude my research by providing principles and tests to consider when analyzing the constitutionality of university policies banning dorm window displays.

Psychology

Who Has Credibility? Effects of Messenger Cis/Trans Identity on Reactions to Controversial Information about Gender Dysphoria

Wesley Johnson, Kora Witthun, Ryan Dobson, Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Humans are not impartial, objective receivers of information. We investigated how individuals' evaluations of scientific information are influenced by the identity of the messenger who provides the information. In the experiment, a sample of college students and a sample of community adults reviewed a handout describing research on gender dysphoria. The handout included information that counters prominent narratives about gender dysphoria prognosis and treatment considerations. We manipulated messenger identity by describing the speaker who provided the handout as either a trans or non-trans professor. Middle-aged adults were not affected by the manipulation; however, college students exposed to the non-trans speaker rated the speaker as less credible, and wanted to censor the speaker more, than did those who were exposed to the trans speaker. This second effect was driven by those students who identified as trans or trans allies. Notably, the college students scored nearly a full point higher than did the middle-aged adults in belief that words can cause emotional harm, and those with stronger belief that words can harm also wanted to censor the speaker. Our findings suggest that individuals evaluate the quality of scientific information differently depending on the identity of the messenger.

Dating in the Digital Age: Mate Retention, Sexual Coercion, and Partner Monitoring Online

Wesley Johnson, Martha Hernandez
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Men and women engage in a variety of behaviors to retain their mates, ranging from positive behaviors such as hugging and taking time to listen to their partner, to negative behaviors such as extensively monitoring their partner's whereabouts and threatening to hurt their partner should their partner leave. In this study, for which data collection is in progress, student participants who are in a romantic relationship complete an online survey. In the survey, participants (1) report frequencies of either their own or their partner's use of specific cyber dating behaviors; (2) complete a brief personality inventory; and (3) provide ratings of their own and their partner's desirability as a mate. In the current study, we investigate (1) men's and women's reported frequency of engaging in positive and negative cyber mate retention behaviors; (2) men's and women's reports of the frequency with which their partners engage in cyber mate retention behaviors; (3) personality predictors of engaging in (and being the target of) negative cyber mate retention behaviors; and (4) associations between (a) individuals' perceptions of their own mate value relative to their partners' and (b) their reported use of negative cyber mate retention behaviors.

Does Lived Experience Trump Medical Expertise? Factors That Predict Reactions to Controversial Information about Antidepressants

Kora Witthun, Wesley Johnson, Ryan Dobson, Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Since 2013, psychiatric drug use has continued to rise despite concerns raised by various scholars that psychiatric drugs lack efficacy (Kirsch, 2010; Whitaker, 2011), that pharmaceutical companies have misled doctors and patients alike (Goldacre, 2014), and that the U.S. is increasingly "medicating normal" (Frances, 2013). In this experiment, we investigate whether people's reactions to information that criticizes psychiatric drugs is influenced by the lived experience and expertise of the messenger providing the information. Specifically, we manipulate the messenger's lived experience by describing the messenger as either using antidepressants themselves, or not, and we manipulate the messenger's expertise on the subject, by describing them as either a medical doctor or not. The information provided by the messenger is critical of psychiatric drugs, saying they are overprescribed, that their "efficacy" is largely a placebo effect, and that they cause many side effects. We hypothesize that the two manipulated variables, messenger's experience with taking antidepressants and messenger's medical expertise, will interact to affect participants' receptivity to the information the messenger provides, and we speculate that the messenger's lived experience will have a stronger impact on people's reactions to the information than will the messenger's medical expertise. Data analysis is currently in progress.

Only Some People Can Say That: Effects of Messenger's Racial Identity on Reactions to Controversial Information about Racism in Policing

Ryan Dobson, Kora Witthun, Wesley Johnson, Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Humans are not impartial, objective receivers of information. In the current study, we investigate the degree to which people's reactions to scientific information about a controversial issue, racism in

policing, are influenced by two factors: the racial identity of the messenger (black or white), and the media platform on which the messenger presents their information (MSNBC or Fox News). Participants read a handout that began with the statement, "Although there are certainly problems with racism in policing, the idea that everyday black people are being unjustly gunned down in the streets by police officers is false given the current evidence." The handout then provided a set of bulleted statistics that run counter to many prominent narratives about the ubiquity of racist policing. The handout included complete references for the statistics provided. We hypothesize that the messenger's racial identity and political platform will interact to affect participants' receptivity to the information. We also expect that individuals' own political attitudes and racial identity will moderate the effects of the manipulations. Data analysis is currently in progress.

Overwhelmed and Overprescribed? College Students' Experiences Seeking Help for Mental Health Concerns

Tia Wieden, Simon Koeper, Kiera McBeath, Adamary Rosas
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Over the past several decades, the percent of individuals reporting a mental health diagnosis (in particular, that of depression or anxiety) has risen, and that upswing has recently accelerated among adolescents and young adults. There are many potential explanations for the rise in mental health concerns, including social, familial, and physical mismatches between modern and ancestral environments; the rise of social media; safetyism and overparenting; and diagnostic inflation. Further, some mental health concerns are manifestations of normative developmental challenges and difficult but transient personal circumstances rather than a product of a "chemical imbalance." Thus, one concern voiced by various scholars is that people with mental health concerns are being overmedicated or medicated unnecessarily. However, there are no published reports of how often and under which circumstances college students, in particular, are recommended to take psychiatric medications. Therefore, the objective of the current study is to document how often young adults are offered and encouraged to take psychiatric medications (compared to other forms of treatment) for their emotional malaise. We will present college students' reports of their experiences seeking help for mental health concerns, as data collection is currently in progress.

Predicting Burnout at Work from Personality Traits and Work Factors

Adamary Rosas, Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Burnout is defined as a chronic, negative, work-related psychological state; it is predictive of job dissatisfaction, low levels of productivity, and job turnover. Burnout is particularly common for individuals working in people-oriented professions, including healthcare and education. Previous research has established links between burnout and a variety of work factors, such as a lack of autonomy and control at work. Research has also established links between personality traits, such as negative emotionality, and susceptibility to burnout. In the current study, we measured burnout, thirteen specific work factors, and five broad personality traits for two samples of workers: (1) faculty and instructional staff at the University of Wisconsin-Eau Claire, and (2) Mayo Clinic physicians and nurses. One third of UWEC respondents and nearly half of Mayo respondents expressed a high level of burnout. In both samples, scoring low in agreeableness and high in negative emotionality predicted higher burnout scores. We will present the results of regression analyses designed to identify work factors that can predict burnout after controlling for employees' personality traits.

Shoot the Messenger: Effects of Messenger Gender Identity on Men's and Women's Reactions to Information about Evolved Differences Between the Sexes

Parker Lay, Ryan Dobson, Kora Witthun, Wesley Johnson
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Statistical evidence of evolved differences between the sexes is unrecognized and considered taboo by many scholars, including some psychological scientists (Buss & von Hippel, 2018); indeed, individuals have been fired for suggesting that a comprehensive understanding of gender disparities in valued vocational outcomes requires consideration of evolved distributional differences between the sexes in abilities, interests, and personality traits. We tested the hypothesis that women respond less favorably when the messenger relaying such information is a man rather than a woman. A college student sample and middle-aged adult sample reviewed a handout that (1) argued against prominent narratives about gender discrimination as the primary cause of women's under-representation in certain high-status occupations, and (2) described research on dispositional sex differences in abilities, interests, and personality traits. We manipulated messenger identity by describing the speaker who provided the information as either a male or female professor. Particularly in the college student sample, women who were told the information was from a male professor responded less favorably than did women who were told the information was from a female professor. Our findings add to existing evidence that humans are not impartial pursuers of knowledge.

Some Sex Differences are More Problematic than Others: Perceptions of Male and Female Overrepresentation in Low- and High-Paying Jobs

Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Some gender disparities are viewed as more problematic than others. For example, people tend to view men's overrepresentation in STEM occupations, such as engineering, as more problematic than women's overrepresentation in people-oriented professions, such as nursing. In the current research, we assess these perceptions as well as attributions of the causes of gender disparities in occupational representation. In study 1, participants reviewed factual gender representation statistics about two jobs, one low and one high in annual salary, in which either men or women are over-represented (e.g., Landscaping workers at $30,000/year and Chemistry professors at $90,000/year, or Hairstylists at $30,000/year and Social Work professors at $90,000/year). In Study 2, the design was identical except that one job was of moderate salary ($50,000/year) and one was of very high salary (>$110,000/year). Participants rated how problematic the gender disparity was and provided judgments about various causes of the disparity: socialization/gender roles, sexism/discrimination, sex differences in physical abilities, sex differences in mental abilities, and sex differences in interests. We predict that participants will view female over-representation in low-paying jobs and male over-representation in high-paying jobs as particularly problematic and caused by gender roles and discrimination. Data collection for this study is currently in progress.

Does Lived Experience Trump Medical Expertise? Factors that Predict Reactions to Controversial Information about Antidepressants

Kora Witthun, Wesley Johnson, Ryan Dobson, Parker Lay
Faculty Mentor/Collaborator(s): April Bleske-Rechek

Since 2013, psychiatric drug use has continued to rise despite concerns raised by various scholars that psychiatric drugs lack efficacy (Kirsch, 2010; Whitaker, 2011), that pharmaceutical companies have misled doctors and patients alike (Goldacre, 2014), and that the U.S. is increasingly "medicating normal" (Frances, 2013). In this experiment, we investigate whether people's reactions to information that criticizes psychiatric drugs is influenced by the lived experience and expertise of the messenger providing the information. Specifically, we manipulate the messenger's lived experience by describing the messenger as either using antidepressants themselves, or not, and we manipulate the messenger's expertise on the subject, by describing them as either a medical doctor or not. The information provided by the messenger is critical of psychiatric drugs, saying they are overprescribed, that their "efficacy" is largely a placebo effect, and that they cause many side effects. We hypothesize that the two manipulated variables, messenger's experience with taking antidepressants and messenger's medical expertise, will interact to affect participants' receptivity to the information the messenger provides, and we speculate that the messenger's lived experience will have a stronger impact on people's reactions to the information than will the messenger's medical expertise. Data analysis is currently in progress.

Probability Discounting of Attending In-Person Events throughout the COVID-19 Pandemic

Morgan McCarville
Faculty Mentor/Collaborator(s): Carla Lagorio

After over two years, the COVID-19 pandemic is still a prevalent issue in society. Although various precautionary measures have been developed, there is individual variability in adherence to public health and safety guidelines along with variability in amount of risk tolerated. With individuals largely making their own decisions about exposure risk, it can be informative to better understand how these decisions are being made. The current research examines how attendance at lower- and higher-risk activities is impacted by probability of COVID-19 exposure (community spread). Decisions regarding attendance was modeled using a probability discounting assay asking participants their likelihood of attending class in person and attending bars or restaurants as a function of the probability of exposure to or contracting COVID-19. Results are presented across different time points (Spring and Fall 2021) and display a similar decline in attending both activities as exposure increases, with a slightly higher probability of attending classes in person in the face of both exposure and contracting COVID-19. Interestingly, despite vaccines becoming widely available between the time points studied, participants were not much more likely to attend events in person in Fall 2021. Future data collection could continue assessing discounting rates as pandemic conditions change.

Assessing the Relationship between Pandemic Concerns and Devaluing Delayed Consequences

Natalie Lasinski
Faculty Mentor/Collaborator(s): Carla Lagorio

Throughout the COVID-19 pandemic, citizens have largely been left to make personal risk-benefit decisions for themselves. People's everyday decisions about life activities now include an additional cost-benefit analysis involving probabilistic risk of disease associated with probabilistic disease severity, and over the past two years we have seen people not only adopt differing strategies but have varying levels of concern about pandemic effects on their personal health or society more generally. The area of behavioral economics provides an approach to understanding individual differences in decision making that incorporates psychological and economic principles. Among these mechanisms, the current research will investigate delay discounting (how positive or negative future outcomes are devalued as they are delayed); such procedures have been widely used to assess a person's level of self-control. The aim is to compare this measure with individual participant's level of concern about issues influenced by the COVID-19 pandemic (e.g., economic recession, university closures, healthcare system overload). Results indicate little relation between discounting and societal concerns, with reported levels of concerns ranging widely across participants. Only when examining those with more extreme discounting scores (highly self-controlled or impulsive) do we see potential correlations, with more impulsive individuals indicating stronger concerns about employment, economic recession, and society becoming more self-centered. More fine-grained analyses could investigate this relation further to better understand how people with varying decision-making strategies are impacted by or respond differently to pandemic effects.

Concerns and Confidence in Institutions throughout the COVID-19 Pandemic

Sydney Parce
Faculty Mentor/Collaborator(s): Carla Lagorio

The COVID-19 pandemic has directly influenced or brought to the forefront different societal concerns, including the availability of healthcare, employment, food or supplies, and education. These concerns can have an impact on people's confidence in various institutions' ability to respond to interests that are most pressing to them. As the pandemic continues to progress and change, it is important to assess the concerns and how the pandemic directly or indirectly affects society. The current research is part of a more extensive survey investigating decision-making throughout the COVID-19 pandemic. Specifically, this project documented participants' level of concern about several societal problems along with their confidence in larger institutions ability to respond effectively to the pandemic (e.g., media, hospitals). Unique participants completed the survey at different time points, allowing us to assess how views are changing over time. Results indicate that concerns and institutional confidence levels vary but remain largely unchanged throughout 2021, despite vaccine availability becoming widespread. Future research could document whether these measures shift as pandemic conditions evolve.

COVID-19 Vaccination Status and Level of Trust in Information Sources

Kelcy Coleman
Faculty Mentor/Collaborator(s): Carla Lagorio

Many health organizations around the world recommend vaccination against COVID-19 to reduce severity of disease and slow spread of the virus. While recommended, American citizens hold the right to

choose whether to be vaccinated. From an individual and public health standpoint, it is important to better understand the perspectives of unvaccinated individuals to address hesitancies and potential barriers. One potential factor is the substantial amount of misinformation spread about COVID-19, with research showing that nearly 80% of Americans have seen at least one piece of misinformation and either believe it is true or are unsure if it is true (Hamel, 2021). Other research has found a relationship between trust, belief in conspiracy theories, and spread of misinformation on social media with people's hesitancy to get vaccinated (Jennings, 2021). The current research explores this further by assessing correlations between vaccination status and individual's self-reported level of trust in different sources of information (e.g., social media, national or national news, coworkers), along with perception of COVID being media hyped or personally concerning. Results indicate that individuals who are not vaccinated display a significantly higher level of distrust in many media sources along with less trust in doctors and healthcare workers. Future research could examine ways to overcome these barriers and assess whether perceptions and behaviors change as pandemic conditions continue to evolve.

Does Clozapine Affect the Discriminative Stimulus Effects of Food Deprivation in Rats Trained to Discriminate Between 2 and 22 Hours Food Deprivation?

Tatum Sweeney, Haley Quandt, Sydney Wenzel, Paige Drazkowski, Simon Tangen, Blake Vander Weide, Erika Cedarbloom, Sam Petit, Gina Grosland, Courtney Passint

Faculty Mentor/Collaborator(s): David Jewett

In humans, weight gain is a side effect of several atypical antipsychotics including clozapine. We investigated if clozapine would affect the discriminative stimulus effects of food deprivation. Male, Sprague-Dawley rats (n = 11) were trained to discriminate between 22 and 2 hrs food deprivation in a two-lever operant task. Rats were trained to press the right lever after 2 hrs of food deprivation to earn a 45 mg food pellet. Under 22 hr deprivation conditions, the left lever was reinforced. After acquiring discrimination, subjects were food deprived for 2 or 22 hrs and administered clozapine (1.0-5.6 mg/kg, s.c.). or vehicle (30% DMSO; 1.0 ml/kg, s.c.). Testing sessions lasted until subjects earned 5 reinforcers or 5 minutes elapsed. Discriminative stimulus effects of food deprivation and response rates were assessed every 15 min for 2 hrs. Results showed that clozapine did not induce hunger under the 2 hr deprivation. After 22 hrs food deprivation, clozapine (1.0-5.6 mg/kg) significantly reduced hunger. Under both deprivation conditions, all doses of clozapine decreased response rates and food intake, with the exception of 1.0mg/kg increasing response rates under the 22 hr condition. These data provide further support for the notion that clozapine decreases feeding-related behaviors in rats.

The Effect of Empathy Perspective Taking on Racial Prejudice

Madelin Cieslicki

Faculty Mentor/Collaborator(s): *David Leland*

Previous research has provided support for perspective taking as a way to reduce racial prejudice. However, Dr. David Sparkman has been unable to reproduce such results in his lab. In our current study, Paige Panzenhagen, David, and I are researching whether empathy perspective taking of a Black man or a Native man effectively reduces inter-group racial prejudice.

Smartphone Use: Association with Attention and Sleep

Grace Thompson, Rebecca Sheetz, Christine Le, Claire Kidwell, Clara Gland, Emily Kerr, Jay Grzybowski
Faculty Mentor/Collaborator(s): David Leland

Smartphones are commonly thought to be associated with distraction and sleep difficulties. We are investigating the association between smartphone use/dependence, personal traits relating to attention, impulsivity, and sleep patterns in college students. In a previous survey, we demonstrated negative correlations between phone use/dependence and mindfulness (using the Mindfulness Attention Awareness Scale; MAAS) and sleep quality, along with positive correlations between phone use/dependence and attention difficulties as measured using the Adult ADHD Self-Report Scale (ASRS). Since our previous study, a positive correlation has been reported in the literature between impulsivity and phone usage. Therefore, in our current survey, we incorporated the Abbreviated Impulsivity Scale (ABIS), predicting positive associations between impulsivity and phone use/dependence. Preliminary results replicate our prior findings with mindfulness and attention problems but so far do not support an association with impulsivity. In addition to examining the relationship between smartphones, attention, sleep, and other traits, we are using this survey to help identify potential subjects for a brain electrophysiology experiment that addresses whether smartphones have a causal impact on attention.

Smartphones, Attention, and Brain Electrical Responses

Grace Thompson, Rebecca Sheetz, Christine Le, Claire Kidwell, Clara Gland, Emily Kerr, Jay Grzybowski
Faculty Mentor/Collaborator(s): David Leland

Given concerns about how distracting smartphones can be, we are interested in how they affect attention-related brain electrical activity. Previous research demonstrates that the presence of one's smartphone impairs behavioral performance on an attention task. We are investigating whether the P300, an attention-sensitive component of brain electrical activity in the electroencephalogram (EEG), is suppressed in the presence of one's smartphone. We assess this while subjects perform an oddball task, requiring attention and responses to rare "target" stimuli among many task-irrelevant "standard" stimuli. Beta activity, i.e. brain electrical activity in the frequency range of 13-30 Hz, is another potentially useful measure since its amplitude/power is greater when an individual is more attentive or alert. Prior research has found increased beta power in nicotine-dependent individuals viewing a cigarette; likewise, we predict that subjects with relatively high use/dependence on smartphones will show greater beta activity when viewing their phone than a control object. By complementing behavioral measures with EEG we hope to advance the understanding of how smartphones engage and can affect attention.

Assessing STEM Engagement in a Cognitive Electrophysiology Course

Rebecca Sheetz, Christine Le
Faculty Mentor/Collaborator(s): David Leland

HNRS 118: "Cognitive Electrophysiology," a new course added to the Honors Program colloquia Spring 2022, focuses on the use of brain electrical signals, record via electroencephalography (EEG), to study mental processes. PURSUE (Preparing Undergraduates for Research in STEM Using Electrophysiology) created the curriculum to reflect nationwide intercollegiate efforts to engage students in STEM through learning about EEG. We are investigating interest and engagement in STEM and cognitive neuroscience

according to the students in the pilot class of HNRS 118 and we plan to compare results against data from other 100-level Honors classes and those enrolled in PSYC 374: Cognitive Neuroscience. Presumably, students from the 100-Level Honors courses will not have any exposure to EEG, while PSYC 374 offers a short unit covering the methodology used in neuroscience. HNRS 118 students displaying attitudes towards STEM more like those in other STEM Honors courses and those in PSYC 374 compared to other non-STEM Honors 100-level students would demonstrate the effectiveness of this course in garnering interest in STEM. This research will cultivate the development of this course. We also plan to compare our findings with those from EEG courses being offered at other institutions associated with PURSUE.

The Role of Aging Education on the Beliefs Held about Aging

Grace Gunderson, Samantha Williams
Faculty Mentor/Collaborator(s): Jarrod Hines

This study will examine how education and attitudes about aging relate to the endorsement of stereotypes and expectations about the aging process. Western stereotypes about aging are generally pervasive and negative (Hummert, 2011). Personal endorsement of these stereotypes can be reflected in expectations regarding the aging process. However, even brief educational interventions can result in more positive perceptions of aging (e.g., Macdonald & Levy, 2021). In this study, we will define formal education as human development coursework. Informal education will include both anecdotal life experiences and employment history. We will use Palmore's (1981) Facts on Aging Quiz to measure participants' general knowledge about aging. A variation of the Age Implicit Association Test will be used to assess unconscious age-related preference. Variations of the General Beliefs about Memory and Personal Beliefs about Memory questionnaires (Lineweaver & Hertzog, 1998) will be used to assess explicit beliefs regarding age-related changes in memory function. We expect to find that increased formal education relates to more accurate knowledge about aging and less age-related bias. We also expect that participants who have undergone formal education will be less likely to apply negative aging stereotypes about memory to their future selves than those without such education.

Comparing Risk and Protective Factors for Suicidal Behavior among Students with Disabilities

McKenna Roessler
Faculty Mentor/Collaborator(s): Jennifer Muehlenkamp

Despite research showing that people with any disability engage in suicide attempts at a rate four times that of individuals with no disabilities (Meltzer et al., 2011), there remains a lack of research on risk and protective factors for suicide among individuals with different types of disabilities. We hypothesized that people with hidden physical, psychiatric, and learning disabilities would differ in levels of suicidal behavior compared to those with visible disabilities, and that different factors would predict suicidality. Participants were recruited from five UW system campus disability departments and completed an anonymous online survey assessing belongingness, burdensomeness, self-esteem, resilience, social support, school engagement, satisfaction with school services, and suicidality. Results from a one-way ANOVA indicated that there was a significant difference between those with hidden disabilities compared to those with a combination of both hidden and physical disabilities on resilience and suicidal behavior. Regression analyses showed that the variables associated with lifetime suicidality differed between the disability groups. These results highlight the importance of tailoring prevention strategies to the unique

needs of each disability group. However, quality disability services appeared to be protective for all groups.

Coping through Covid: An inside Look into the Positive Effects of Coping during the Covid-19 Pandemic

Carley Owens, Dane Nelson, Nicholas Grande, Emma Steffel
Faculty Mentor/Collaborator(s): Jennifer Muehlenkamp

The COVID-19 pandemic brought serious risks to the mental health of the public. The uncertainty surrounding the virus outbreak, mass lockdowns, and fear of economic recession predicted increased suicide and mental disorders associated with suicide. While these stressors had an overwhelmingly negative effect on the public, some individuals experienced an opportunity to build on and create new coping mechanisms against adversity during the pandemic. With the majority of research focusing on the negative effects of the COVID-19 pandemic, we aimed to explore the alternate side, hypothesizing that individuals who report increased positive coping implications during the pandemic will also report lower rates of past year NSSI and hopelessness, as well as increased resilience and overall mental health. Our results showed that improved coping mechanisms during the pandemic significantly lowered incidents of NSSI as well as increased resilience compared to those with no improvement in coping. Results also showed that hopelessness, self-compassion, and resilience significantly predicted whether someone reported improved coping skills due to COVID-19. More research aimed to examine the possible positive effects the pandemic had on mental health should be explored as we gain insight into the lasting effects of COVID-19.

Effectiveness and Perceived Utility of Resilience Webinar Program for Student Recreation Staff

Lindsay Littleton
Faculty Mentor/Collaborator(s): Jennifer Muehlenkamp

The occurrence and severity of mental health issues have been increasing among college students; therefore, it is critical that universities offer support. Strengthening resilience can improve mental health for students, but research on campus resilience programs is limited. The purpose of this study was to examine the impact of a campus resilience webinar program. Our present study used archival data from 141 recreation staff students to evaluate student perceptions of the usefulness of a resilience webinar series consisting of five 15-minute webinars, each completed about 3 weeks apart. Student employees were asked to complete a pre-resilience survey, watch each webinar, and turn in a short reflection activity along with five evaluation items per webinar, followed by a post-resilience survey at the end of all 5 webinars. A one-sample t-test was run to compare pre-and post-webinar average resilience scores. Results showed a significant effect with post-resilience scores being higher than pre-resilience scores. Additionally, most students perceived the webinars to be useful, valuable, and reported a high likelihood of using the skills taught. These results suggest that short resilience webinars may be effective in improving student resilience which, in turn, may improve college student well-being.

Nurse Training, Attitudes, Comfort, and Confidence in Suicidal Patient Care

Nicholas Grande, Emma Steffel
Faculty Mentor/Collaborator(s): Jennifer Muehlenkamp, Marcie Talbott

Emergency department (ED) visits related to suicide continue to increase, and ED nurses are said to be on the "front lines" of suicide prevention. Yet, many nurses do not receive adequate training to care for suicidal patients. Lack of training can contribute to negative attitudes towards suicidal patients, decreased comfort and reduce confidence working with suicidal patients, potentially impacting quality of care. Limited research shows that suicide specific training is related to improved attitudes, comfort, and confidence independently, but it remains unclear how these factors are interrelated. We hypothesized that ED nurses' confidence in caring for suicidal patients would mediate the relationship between training and attitudes/comfort caring for suicidal patients. ED nurses from a local hospital completed an anonymous survey evaluating attitudes, comfort, and confidence towards working with suicidal patients, and suicide-intervention training received. Training in suicide-specific care was low. Additionally, training was associated with ED nurse attitudes/comfort working with suicidal patients because training was linked to increased confidence in one's ability to intervene. Providing training to ED nurses for working with suicidal patients is important to ensure proper care and may also improve quality of care. Limitations and implications of these results will be discussed.

Social Support and NSSI: The Impact of COVID-19 Stress

Isabel Yu, Amber Bouche, Emily Wagner
Faculty Mentor/Collaborator(s): Jennifer Muehlenkamp

This study aims to understand the impact of COVID-19 stress on the relationship between social support and NSSI. Prior research found that during the pandemic stress increased and social support decreased (Carosella, et al., 2021), which may have contributed to the increased NSSI observed among adolescents during the pandemic (Zetterqvist, 2021). For this study, we tested the hypothesis that COVID-19 stress would moderate the relationship between social support and NSSI. A random sample of undergraduate students completed an online survey ($n= 309$, *77.7%* female, 91.6% white) measuring COVID stress, social support, and NSSI frequency. We ran a moderated regression analysis via process macro in SPSS with 5,000 bootstrapped re-samplings. Our hypothesis was supported as COVID-19 stress moderated the relationship between social support and NSSI ($t = -2.26$, $p < .03$). When social support was low and Covid stress was high, past year NSSI was significantly higher than when COVID stress was moderate or low. The model accounted for 7.0% of the variance $(F (3.00, 305.00) = 7.63, p < .001)$, indicating a small effect. Our results highlight the importance of social support for at-risk individuals during times like the pandemic.

Evaluating Patterns of Preference Displacement including Social Interaction

Natalie Lasinski, Sydney Parce
Faculty Mentor/Collaborator(s): Kevin Klatt

Preference assessments are behavioral procedures used in applied work with children to identify putative reinforcers to be used in skill acquisition or the reduction of problem behaviors. Preference displacement, or disproportionate preference for one type of stimulus, is evaluated by combining stimulus classes in a single assessment. Past research has evaluated patterns of preference displacement between edible and leisure, or tangible, stimuli among children diagnosed with autism and initially demonstrated that edible

stimuli displaced leisure stimuli. Further research, however, demonstrated no displacement, partial displacement, or the displacement of edible stimuli by leisure stimuli. Edible and tangible stimuli are often used in behavioral intervention to teach skills or reduce problem behaviors, but social interactions have also been shown to function as reinforcers for both typically developing children and children diagnosed with autism. The current study includes edible stimuli and social interactions to evaluate whether patterns of displacement will appear. Single-stimulus class preference assessments of edible and social stimuli were conducted to identify highly preferred stimuli from both classes to utilize in combined assessments and evaluate displacement. Data collection is ongoing but results for three participants show complete displacement of social interactions by edible stimuli.

Exploring Associations among College Students' Reports of Parent Involvement, Self-Efficacy, Fear of Negative Evaluation, and Resilience

Brittani Hunter, Cameron Merline
Faculty Mentor/Collaborator(s): Mary Beth Leibham

While parent involvement is important for children's and adolescents' well-being, academic success, and adaptive behaviors, overparenting has been associated with decreased levels of social adjustment and well-being in adolescents and college students (Cui, et al., 2019; Darlow, 2017; Gagnon, 2019). Overparenting is characterized by excessive and developmentally-inappropriate parental involvement and is commonly referred to as 'intensive parenting' or 'helicopter parenting' (Segrin et al., 2015). The purpose of the current study is to explore UWEC students' self-reports of parental involvement, self-efficacy, and resilience. Using an online survey methodology, we will assess students' 1) current experiences with parental involvement (e.g., how often parents assist with school-related tasks and intervene with current stressors), 2) reported levels of general self-efficacy (i.e., perceived confidence in the ability to set and achieve goals), and 3) reported levels of resilience (i.e., ability to bounce-back after setbacks). We anticipate that parent involvement will be negatively associated with both self-efficacy and resilience since excessive parent involvement may hinder opportunities for students to develop confidence and coping mechanisms for dealing with challenging tasks and setbacks. This study may contribute to our understanding of college student wellbeing since self-efficacy and resilience are important characteristics for successful adjustment to college.

Investigating the Relationships among Empathy, Culture Dynamic, and Motivation in College Students

Ashley Lutzke
Faculty Mentor/Collaborator(s): Mary Beth Leibham

Empathy is an essential emotion, allowing us to make and maintain relationships and enabling us to effectively interact with strangers. Some studies have found a decrease in empathy among college students from 1979 to 2009, and while it is unlikely that this decrease is due to a unitary factor, researchers have proposed various explanations. Motivation, specifically goal orientation (mastery vs. performance goals), may be associated with empathy as those who score high in performance orientation tend to be focused on outperforming others. Another variable that may be related to empathy is culture dynamic (individualist vs. collectivist; vertical vs. horizontal) as cultures with a vertical or individualistic dynamic tend to be more focused on individual achievement.Using a survey methodology, this study aims to explore college students' empathy, reported culture dynamics, and goal orientations. The three research questions are: 1) What are college students' reported empathy levels?, 2) Are there group differences

(e.g., sex, ethnic, class level) in college students' empathy levels, culture dynamics, and goal orientations?, and 3) Are there relationships among empathy, culture dynamic, and motivation? Relationships among these variables will be examined, and findings from this study will inform the factors associated with empathy and possibly the recent decline.

Enhancing Math Effort and Accuracy by Fostering a Growth Mindset

Ellie O'Flanagan
Faculty Mentor/Collaborator(s): Mary Beth Leibham

Growth mindset interventions can have significant, positive effects on students' perceptions of themselves, effort in school-related tasks, and overall academic achievement (Molden & Dweck, 2006). The current study was heavily influenced by Bostwick and Becker-Blease's (2018) research on the effects of growth mindset interventions on academic performance. An ABAB reversal single-case design was used to compare the effects of a growth mindset message and a control, or neutral, message on fourth grade students' effort and accuracy in mathematics. Participants' overall mindset was also measured at four time points throughout the study. Participants included three fourth grade students participating in a four-week summer math clinic provided by a Midwest university. The results were mixed, with no clear effects related to hearing a growth mindset message.

Implementation of a Cultural Competency Learning Module within an Interprofessional Clinical Experience

Jennifer Schmidt, Mika Colson, Kylie Moker, Anaka Hanson
Faculty Mentor/Collaborator(s): Michael Axelrod

The integration of interprofessional collaboration and culturally competent practice has the potential to enhance outcomes, expand service delivery options, and address systematic racism in applied practice settings (Cahn, 2020; Oelke, Thurston, & Arthur, 2013). However, frameworks for interprofessional collaboration often ignore its intersection with cultural competency and remain untested in applied settings. For school psychologists, collaboration with colleagues is crucial to delivering student and systems-level services. Likewise, school psychologists must be cognizant of cultural and individual differences among colleagues to promote socially just practices. This study examined whether a brief online course on cultural competency embedded within a larger interprofessional collaborative training experience would increase participants' perceptions of their knowledge and attitudes towards working with other professionals with diverse experiences. Participants included pre-service educators (e.g., school psychologists, teachers, speech-language pathologists) enrolled in a clinical practicum course during the 2021-2022 academic year. The clinical practicum emphasized delivering behavioral health and academic assessment services within an interprofessional context. Participants completed a 2-hour online training that included readings, informational videos, and self-reflections on the intersection between cultural competency and interprofessional collaborative practice. Topics focused on culturally competent practices, interprofessional collaboration, conflict prevention and resolution, and the intersection of these themes as a mechanism to promote social justice in behavioral health and education. A one-group pretest-posttest design was used to compare the mean differences in participants' cultural competency and interprofessional collaboration attitudes, perceived knowledge, and content knowledge before and after completing the online course. Several themes emerged when analyzing the data. First, participants perceived themselves as more knowledgeable regarding terminology related to interprofessional collaboration (e.g., professional privilege, interprofessional practice) after taking the course. Second,

participants reported stronger beliefs about privilege and power differentials existing in the workplace and more confidence in their own ability to respond effectively to conflict when engaged in interprofessional practice after taking the course. Finally, content specific knowledge improved in the areas of cultural awareness and conflict prevention and resolution. More notably, participants had a better appreciation for the frameworks for cultural advocacy and social justice after taking the course. Implications focus on how a brief online course might address training needs related to the intersection of cultural competence and interprofessional practice. Discussion will also address how this specific course might be improved to train future cohorts to be more effective interprofessional collaborators within a social justice framework.

The Effects of a Short-term Strengths-based Positive Psychology Intervention on Subjective Well-Being

Megan Meyer
Faculty Mentor/Collaborator(s): Mickey Crothers, Mary Beth Tusing, Melissa Coolong Chaffin

Students with complete mental health, which is defined as average to high well-being and low psychopathology are found to have superior physical health, social relationships, and self-concepts, whereas troubled students with low well-being and elevated psychopathology experience diminished self-concept and physical health, myriad social problems, and low grades and test scores (Suldo, 2016). This study explored the effects of a short-term strengths-based positive psychology intervention using adapted activities from Suldo's (2016) Well-Being Promotion Program on participants' subjective well-being. A multiple baseline treatment design was used to compare participants' levels of well-being before and during the intervention. Intervention sessions occurred 1-2 times per week for approximately 15 minutes over the duration of four weeks. Participants included three individuals entering 4th grade and one individual entering 3rd grade who participated in UW-Eau Claire's Human Development Center summer math intervention clinic either in-person or virtually. Implications from this study will be discussed in terms of how a short-term strengths-based positive psychology intervention can be utilized with elementary-aged students in an engaging way that focuses on their 'superhero' strengths and well-being.

An Exploration of the Impact of COVID-19 on Collegiate Student Athletes

Brett Farmer
Faculty Mentor/Collaborator(s): Stacey Jackson

The purpose of this study was to examine the mental health repercussions of the pandemic, particularly for college student-athletes, and how this affected their athletic and academic performance, resilience, well-being, and coping strategies. The COVID-19 pandemic had an immense impact on the entire world, but with competitions, practices, and day-to-day activity for student-athletes constantly at the mercy of administration, we explored how these stressors may have affected student-athletes' well-being in the classroom and in competitive settings. NCAA conducted a study shortly after the pandemic began regarding student-athletes' well-being and needs. With alarming results, we created our study to reflect on the needs of the student-athletes and whether or not they have been properly met. Through a survey sent to all UW-Eau Claire student-athletes, we asked participants to reflect on their academic and athletic needs throughout the pandemic and how they coped with the stress of COVID-19. We used qualitative and thematic analyses to reflect on 169 student responses regarding growth and what they learned about their coping strategies. Results also contain classification by sport, gender, and academic standing, as well as students' indication of whether or not they still have concerns about their academics and athletics.

The Effectiveness of Empathic Communication Training on Goals of Care and End of Life Conversations

Sam Petit
Faculty Mentor/Collaborator(s): Meg Lagunas, Jim Deming, Rebecca Brustad, Patty Horecki

Even for trained healthcare workers, conducting goals-of-care (GOC) and end of life (EOL) conversations are difficult and often avoided leading to decreased patient satisfaction and decision making. This study aimed to assess the effectiveness of a multidisciplinary training workshop delivered to oncology department staff to improve confidence and knowledge with empathic GOC and EOL communication. The 3-part online workshop provided content on verbal communication, dealing with strong emotions, delivering serious news, and establishing relationships with patients followed by skill practice with trained standardized participants. Forty-nine participants completed pre, post, and four month follow up Qualtrics surveys to assess participants' knowledge and confidence in conducting GOC and EOL conversations. Participant knowledge statistically improved after the workshop, but knowledge growth was not retained four months later. Participant confidence improved after the workshop series and remained significant four months later. For each survey, 20-35% of participants reported that either discussing serious news with patients, dealing with strong emotions, or talking with patients about dying were the most difficult topics they manage. The data supports the effectiveness of a multidisciplinary training workshop on improving oncology staff's confidence and knowledge with GOC and EOL conversations as well as their satisfaction with the workshop experience.

Public Health & Environmental Studies

Comparison of Nitrate Levels in Eau Claire County, WI Private Wells and Municipal Tap Water

Will Lawler, Aaron Schmeiser
Faculty Mentor/Collaborator(s): Laura Suppes

Nitrate is a common contaminant in drinking water known to cause human health issues like blue baby syndrome. While municipal drinking water facilities monitor nitrate and apply treatment, private well water is untreated and nitrate is only tested at the owner's request. This study compares monthly average nitrate concentrations over the course of a year in Eau Claire, WI private well water and municipal tap water. The objective was to identify differences in annual and monthly nitrate concentrations in municipal water and unmonitored, untreated well water. Average monthly nitrate concentrations in 2020 were provided by the Eau Claire City-County Health Department and Eau Claire municipal drinking water facility. A students t-test was performed to assess differences in average nitrate concentrations for all of 2020 and by month. Results show a statistically significant difference in average nitrate levels in 2020 between municipal and private well water (p-value = 0.0114). Although Eau Claire private well water had a higher average nitrate concentration in 2020, average nitrate in both wells and municipal water were below the safe standard of 10 mg/L set by the Environmental Protection Agency (EPA). However, the maximum nitrate concentration found in private well water was over 40 mg/L, which is far above the EPA's Maximum Contaminant Level. Private well owners in Eau Claire County should regularly test their water to ensure nitrate levels are below 10 mg/L.

Restoration of the Salton Sea: A Stakeholder Engagement Model for Sustainable Development

Martin Kocher
Faculty Mentor/Collaborator(s): Karen Mumford

Over the past several decades, the Salton Sea in southern California has suffered from environmental degradation and lack of support for remediation leading to one of the largest environmental disasters in California. This environmental disaster was caused by unsustainable agricultural practices and real estate development and has widened social and health disparities among nearby Latino and Indigenous residents. To restore California's largest lake, multiple parties across the private, public, and non-governmental sectors are collaborating to develop sustainable solutions. For this case study, a literature review was conducted to document the unique environmental and social history of the Salton Sea. In addition, a site visit to the Salton Sea area was conducted in Fall 2021 to identify key stakeholders and to examine the stakeholder collaboration process that developed to restore the lake. Information was collected about the stakeholders engaged in the process and then each stakeholder interest was categorized as meeting one or more of the three pillars of sustainable development, which are environmental, economic, and social. My case study highlights the importance of an inclusive stakeholder collaboration process and how this process can serve as a model for sustainable development.

A New Normal: The Impact of the COVID-19 Pandemic on Non-Profit Organizations in Eau Claire, Wisconsin

Maddie Loeffler, Emily Skoog, Oscar Sexauer
Faculty Mentor/Collaborator(s): Karen Mumford, Pamela Forman

Non-profit organizations (NPOs) are critical for providing services that address important community needs. The COVID-19 pandemic disrupted the capacity of many NPOs to fulfill their mission. A qualitative study was conducted to examine the extent to which COVID-19 reduced the capacity of NPOs serving the Eau Claire, Wisconsin community. Individuals from a convenience sample of 16 non-profit organizations in Eau Claire participated in virtual interviews. The sample of NPOs represented a diversity of interests (environmental, mental health, food insecurity, racial justice, etc.) and varied based on their organizational structures and levels of funding and financial support. A questionnaire was developed to ask individuals representing NPOs various questions about their role in the community, including specific questions about the impacts of COVID-19 on their organization. Interviewees described their organizations' experience adapting to the pandemic, challenges they faced, and efforts to continue fulfilling their goals in a way that they had never experienced before. Theme analysis of interview transcripts revealed that the greatest limitations faced by nonprofits during COVID-19 were the effects of social distancing on programming and fundraising. In addition, smaller grassroots organizations with smaller budgets were less able to adapt to the impacts of the COVID-19 pandemic.

Chemiluminescence Flow Analysis for Monitoring of Respirable Crystalline Silica

Celine Liew, Courtney Zine
Faculty Nominator: James Boulter

Recently, the Occupational Safety and Health Administration (OSHA) has implemented an 8-hour exposure limit of 50 $\mu g/m^3$ and action limit of 25 $\mu g/m^3$ SiO_2 in order to reduce the harmful health effects of respirable crystalline silica and ongoing incidences of workplace-related disease diagnoses. The

Federal Reference Method analysis accepted by OSHA and the National Institutes of Occupational Safety and Health (NIOSH) requires an 8-hour sample to be collected by filter and be sent off-site for analysis by skilled operators, which imposes time delays of days to weeks between measurements and responses. Our novel analytical method uses Sequential Injection Analysis (SIA) to monitor respirable, airborne, silica-containing particles in occupational settings. It was conceived to be integrated into process engineering controls, encouraged in recent OSHA regulations, to enable suppression of elevated levels of respirable silica particles and to remain below the action level. Our method admits aerosol particles suspended in ambient air into the instrument before discriminating between desired particles and interfering gases. Particles are collected in an aqueous solution for chemical reaction and detection, and subsequently react with an acidic molybdate solution to form a type of heteropoly acid (HPA) which reacts with a luminol solution to undergo chemiluminescence. So far, our research has focused on the last step: forming and detecting HPA via chemiluminescence. We are working to optimize an automated instrumental method for the formation and detection of HPA using SIA as a continuous analysis. Preliminary results suggest detection limits as low as 0.26 nanomoles per second and obtaining up to $1x10^6$ photons. Our current estimate of the instrument's detection limit is 50 $\mu g/m^3$ or less of SiO_2 at approximately 12 samples per hour which compares to the OSHA permissible exposure limit and action limit of SiO_2.

What Do You Do to Reduce the Effects of Climate Change? A Qualitative Investigation of Individual and Societal Actions

Phoenix Leary, David Xing Yi Lee, Ben Worner
Faculty Mentor/Collaborator(s): James Boulter

Climate change is one of the most pressing existential threats facing our world. A plethora of research exists that demonstrates that climate change is real and that it is human caused. To this growing body of literature, this study contributes knowledge about the actions that individuals in United States take to combat climate change, as well as their expectations for how society ought to address climate change. Using thematic analysis techniques (Norwell, Norris, White & Moules, 2017), participant responses to two open ended questions were analyzed (i.e., What actions have you or your family taken to reduce your personal contribution to climate change/global warming? and What societal changes do you think are most important to significantly reduce the effects of climate change/global warming?). Findings indicate that participants act and believe society ought to act in ways that coincide with cultural narratives for combating climate change (e.g., recycling, green purchasing, reducing consumption, and making transportation changes). The efficacy of these actions is discussed and suggestions for improving climate communication are offered.

Social Work

Familial and Societal Impacts on LGBTQIA+ College Students and Mental Health

Brandon Wegner
Faculty Mentor/Collaborator(s): Joshua Potter-Efron

The underlying goal of our research is to explore the lived experience of LGBTQIA+ studentsenrolled at Midwestern Universities. The focus of this research is to identify possible patternswithin their family experiences and social supports in the coming out process, as well as theircurrent experiences within their college communities. Included for consideration in thesepatterns is an exploration of patterns connected to the mental health challenges includingstrategies of coping and resilience as well as challenges in accessing needed resources to developsuch strategies.

How Adverse Childhood Experiences Affect the Mental Health and Academic Performance of College Students

Andrea Peterson
Faculty Mentor/Collaborator(s): Jamie Tester

The questions about the mental and physical health of individuals who have experienced trauma has been a topic of interest that has recently started to gain more attention. Some areas of focus include the extent of a person's trauma, the effect of trauma on future mental and physical health, and the impact trauma has on an individual's interactions with others and forming new relationships. Studies have been done that show that higher Adverse Childhood Experiences (ACEs) scores have been seen to be directly associated with negative mental health outcomes (Chamberlain, 2020). In this study, I will analyze the content of 105 survey responses of college students to find out whether having a higher ACE score would have any impact on academics and relationships.

Sociology

The First Generation Student Experience at UW-Eau Claire: A Case Study

Jaden Mikoulinskii
Faculty Mentor/Collaborator(s): Jeff Erger

"The First The First Generation Student Experience at UW-Eau Claire: A Case Study" aims to access how recruitment and retention efforts can be improved for first generation students at the institution. The population of first generation students is under-represented in campus media and recruitment initiatives nationwide. The study considers university-wide efforts and TRIO-based departments in order to understand how recruitment and retention can be improved for these students. The UW-Eau Claire campus will be benefited by having better recruitment and retention practices and having a solid understanding of how these students can have a positive learning and social experience at our institution. The project also considers current national standards and practices that are implemented at nationally acclaimed public universities. The research considers quantitative retention data, qualitative experiences and practices, as well as overarching goals within the university's strategic plan. This research is practical in that it should lead to implementation or cause change within our institution as a whole. Overall, this topic evaluates the greater issue of equity, diversity, and inclusivity within the university. The study considers how the students themselves have felt during their college experience in terms of affordability, access to resources, and a sense of belongingness.

Special Education and Inclusive Practices

Changing Perceptions of Inclusion: The Role of a Universal Design for Learning Framework in Pre-Service Teacher Preparation

Emily Nickolai, Maura Laesser
Faculty Mentor/Collaborator(s): Karsten Powell

This study focuses on how instruction utilizing a Universal Design for Learning (UDL) framework influences secondary pre-service educators' knowledge and perceptions of inclusion in educating students with disabilities. Achieving greater acceptance of students with disabilities in general education

classrooms requires additional preparation emphasizing inclusive knowledge and skills. For this study, pre-service general educators completed pre- and post- course surveys which focused on students' perceptions of and preparation for inclusive education through examining six constructs. A 30-question survey was completed before and after a pre-service inclusive methods course. Additionally, participants (n=53) developed inclusive lesson plans implementing UDL principles. Researchers found significant change from time one to time two: (a) participants' efficacy for including students with disabilities in their classrooms and (b) their knowledge and skills associated with UDL. Findings of this study indicate that pre-service general 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. Through the continuation of this study, additional data collected will look to provide more reliability and further perceptions on collaboration and inclusive practices within pre-service preparation.

Thinking Outside of the Box: Creativity in Education

Kaitlyn Mortenson
Faculty Mentor/Collaborator(s): Kirstin Rossi

The researchers of this study sought to understand how local elementary teachers are implementing creative practices within their classrooms. Researchers in this study examined the specific ways in which teachers implement creative practices in their classrooms and unpacked teacher beliefs and perceptions about creativity. In this study, researchers used creativity scale data, observations, and interviews to better understand elementary teacher's general perception and practice of creativity in their teaching practices and personal lives. The information gained will inform future teacher practices, and does not to place judgement on current practices. The research study and findings will be shared during this student poster session.

12th Annual Provost's Honors Symposium for Research, Scholarship, and Creative Activity

April 29, 2022
1:00 p.m. – 6:00 p.m.
Davies Center, Third Floor

Session I

Centennial Room
1:00 p.m. – 2:00 p.m.

Equity, Diversity and Exclusivity in Housing and Transportation in Eau Claire, Wisconsin: Results from a Community Needs Assessment

Emily Skoog
Faculty Nominator(s): *Pamela Forman; Ellen Mahaffy*

The City of Eau Claire, Wisconsin strives to support the community through investments in infrastructure and services, and fiscal responsibility. To understand the challenges that Eau Claire, a city that is predominantly white and has a poverty rate of 16.6%, is facing during a global pandemic, we conducted a Community Needs Assessment (CNA). Our interviews with 20 leaders of nonprofit organizations across various sectors (equity, diversity and inclusivity, environment, social justice, health, food security, poverty intervention, housing, transportation, and youth development) revealed economic and racial disparities. This presentation will focus on equity, diversity, and exclusivity within two sectors: housing and transportation.

What Do You Do to Reduce the Effects of Climate Change? A Qualitative Investigation of Individual and Societal Actions

Ben Worner, Emma Dimick (Co-authors: Phoenix Leary, David Lee)
Faculty Nominator(s): *Kristine Knutson & James Boulter*

Climate change is one of the most pressing existential threats facing our world. A plethora of research exists that demonstrates that climate change is real and that it is human caused. To this growing body of literature, this study contributes knowledge about the actions that individuals in United States take to combat climate change, as well as their expectations for how society ought to address climate change. Using thematic analysis techniques (Norwell, Norris, White & Moules, 2017), participant responses to two open ended questions were analyzed (i.e., What actions have you or your family taken to reduce your personal contribution to climate change/global warming? and What societal changes do you think are most important to significantly reduce the effects of climate change/global warming?). Findings indicate that participants act and believe society ought to act in ways that coincide with cultural narratives for combating climate change (e.g., recycling, green purchasing, reducing consumption, and making transportation changes). The efficacy of these actions is discussed and suggestions for improving climate communication are offered.

Menominee Room

1:00 p.m. – 2:00 p.m.

Performance Analysis of Francis Poulenc's Flute Sonata

Charlie Grady

Faculty Nominator(s): *Gary Don*

Many performers choose to go beyond the information in the musical score by personalizing the tempo and dynamics of a piece. For this research, I plan to examine three different performances of Francis Poulenc's Flute Sonata (the premiere performance took place in 1957). I will compare the three performances, looking for contrasts in dynamics, tempo, and expressivity. I intend to show how performers can create multiple versions of the same work.

Neuroprocessing of Music: Clinical Applications

Megan Gawlitta

Faculty Nominator(s): *Lee Rasar*

This project will examine the roles of listening in brain processing based on neuroanatomy and neurophysiology and the biochemistry involved in music listening. Clinical applications for using music listening for health range across ages and populations. Applications shared will include: infants in the NICU who increase oxygen saturation through music listening and learn suck and swallow reflexes through the use of pacifier-activated lullabies; patients with stress who decrease cortisol through music listening when using favorite music; patients with dementia who calm to music with special memories and meaning from their past; patients in physical pain who are able to relax their muscles through listening to music; patients with addictions who learn to change their music preferences to avoid triggers for their addictions; patients who have trauma issues who find peace, comfort, and hope for the future through music listening; patients who are neurodiverse whose brains are organized by rhythm; patients with Parkinson's Disease who improve gait training through rhythmic cueing; and patients with anger issues who learn to redirect and calm through musical mood induction.

BFA Senior Exhibition

Kala Rehberger

Faculty Nominator(s): *Cedar Marie*

Kala Rehberger is an art and psychology double major who has created a body of artwork that explores the complexities of being human. Her large-scale piece, The Head Doesn't Fall, invites the viewer to step into a sculptural diary, a culmination of small clay tiles that work together reminiscent of a quilt. This sculpture shares complex stories of pain, power, heartbreak, acceptance, and growth represented through imagery, text, and color. Personal symbols conceal vulnerabilities while simultaneously offering the viewer the opportunity to connect to stories with universal themes. As a whole, the quilt acts as Rehberger's personal memoir open for the public to read and experience. In her most recent project, she interviewed people of all ages, both strangers and people she knows, about their lived experiences. She is now translating their stories into a series of visual stories in clay that work together in a similar quilt-like fashion. The sculptural patchwork is a shared recollection of life-changing events, influential moments, and lessons learned.

Ho-Chunk Room

1:00 p.m. – 2:00 p.m.

Investigating the Predictive Function of the Detection and Analysis of Covid-19 mRNA in Wastewater

Jordan Corrigall, Logan Anderson, Laura Horstman, Alex Barker

Faculty Nominator(s): *Crispin Pierce*

The growing number of communicable disease outbreaks in recent decades has increased the necessity to develop innovative tools to predict and lessen their impact. A potential tool is the correlation between viral load in wastewater and the number of cases in an outbreak measured at the time of sampling. Recent research by various institutions across the US, including state agencies, universities, and private laboratories, has indicated that viral loads in wastewater during the peak of the covid-19 pandemic are strongly and positively correlated with affected population caseloads. We collected grab and 24-hour composite wastewater samples from three campus dormitories and a children's daycare center. COVID-19-specific RNA markers measured by the Wisconsin State Laboratory of Hygiene were compared to number and date of infections from our sampled populations. While we did find a correlation between increased number of COVID-19 infections and increased viral loads, we did not find a trend of viral loads spikes preceding COVID-19 infections, consistent with state and national results. Wastewater testing provided a powerful, noninvasive confirmatory tool in the verification of a population's health.

Understanding the Lake Breeze Influence on Elevated Ozone at the Lake Michigan Shoreline

Ben Kies, Joe Tirado, Aidan Voon

Faculty Nominator(s): *Patricia Cleary*

Elevated ozone has been of concern at Lake Michigan shoreline locations for many decades. The lake breeze is a key circulation pattern which brings overwater air masses onshore, where inverted air is an ideal reaction chamber for photochemical ozone production. The lower atmosphere has been investigated using uncrewed aerial systems (UAS) to track pollutant transport during lake breeze events during several field campaigns (CHEESEHEAD19, WiscoDISCO-20 and WiscoDISCO-21). From those studies, the vertical profiles of lake breeze impacted air show a complex relationship with ozone, where an internal boundary layer is formed and the highest observed ozone appears within the lowest 100 m altitude, typically above that internal boundary layer.

Modeling Diffusion in Accreting White Dwarfs

Huston Wilhite

Faculty Nominator(s): *William Wolf*

White dwarf stars that gain, or accrete, matter from companion stars are the progenitors of novae and type Ia supernovae, which are among the most luminous transients in the universe. In particular, type Ia supernovae contribute greatly to the processing of hydrogen and helium into all the elements of the periodic table on a galactic scale. How and when an accreting white dwarf can give rise to a type Ia supernova explosion depends on how effectively it can retain its matter through the prelude of smaller nova explosions. Diffusion of accreted material deep into the white dwarf can hinder this mass retention,

so in this project, we model accreting white dwarfs with elemental diffusion. We find that for low accretion rates, white dwarfs lose more mass in a nova cycle than they gain, indicating that these systems are unlikely to lead to type Ia supernovae.

Chancellors Room

1:00 p.m. – 2:00 p.m.

Nurse's Role in Breast Cancer Awareness and Screening

Kaitlyn Moore

Faculty Nominator(s): *Dalete Mota & Theresa Dachel*

This cross-sectional study, via an online survey, investigated breast cancer (BC) awareness and screening behaviors at a Midwestern university during Fall 2021. All students, staff, and faculty were invited to participate. A total of 1245 initiated the survey, the majority being undergraduate students (n=878, 70.5%). Approximately 35% of the respondents reported never having received information about BC. A third shared that they know someone who has been diagnosed with BC. Over 70% know that aging and family predisposition are risk factors for BC. Risk factors related to reproductive health were acknowledged by 20% of the respondents. Knowledge and attitudes regarding BC screening varied significantly; about half reported clinical examination of breasts as a screening method to be performed yearly, but 75% have not had this screening method themselves. Although the age of the participants was young, many didn't know when and how frequent mammograms were recommended for BC screening. This university-wide survey suggests the need for more information about risk factors and BC screening methods. The results help nursing professionals develop evidence-based health promotion activities.

Frontline Health Care Workers' Experience of Covid-19: A Documentary Project

Ellie Decker

Faculty Nominator(s): *Heather Fielding*

This documentary project investigates the frontline experience of the COVID-19 pandemic. Through interviews with nurses and doctors as well as personal photos and reflections, the video works to capture the emotions of life during the pandemic from its start through April/May 2021, when the documentary was completed. The topics discussed in the documentary include initial reactions to the news of a global pandemic, national responses, healthcare facility responses, vaccinations, personal experiences and emotions, and key lessons learned that will be carried into the future.

Session II

Centennial Room

2:10 p.m. – 3:10 p.m.

Creating and Characterizing Zebrafish Knockout Lines for Studying Methylmercury Metabolism

Ashley Lutzke, Celia Dickey

Faculty Nominator(s): *Bradley Carter*

Methylmercury (*MeHg*) is a common environmental pollutant and a known hazard to prenatal health; the primary exposure to *MeHg* for most of the U.S. population is through consumption of contaminated fish, including the Great Lakes region. There is natural genetic variation in the human population among genes that help clear *MeHg* from the body, and some individuals may be more sensitive to *MeHg* toxicity based on which gene versions they have (genotype). This research seeks to determine how different versions of these human genes affect *MeHg* toxicity during early development using zebrafish. We are using gene editing tools to inactivate the fish versions of these genes and add in the human versions, allowing us to test how different gene versions affect *MeHg* toxicity in the context of the developing embryo.

Impact of Low Dose Ethanol on Stimulator Movement in Aged Rats: Comparison to Younger Animals

Gillian Rossmann (Co-authors: Quinn Petersilka, Payton Oliver, Carolyn Shult, Tia Wieden)

Faculty Nominator(s): *Douglas Matthews*

Wisconsin leads the nation in death by falling among older adults and recently it has been hypothesized that this risk is partially due to alcohol intake in the aged population. Aged animals are significantly more impaired by ethanol than younger animals. For example, acute ethanol impairs motor coordination to a greater extent in aged animals compared to younger animals. Recently, we have collected data demonstrating that the stimulatory effects of ethanol are greater in aged animals compared to younger animals. These data suggest a potential explanation for the increased death rate in older Wisconsinites due to falling. Namely, alcohol use increases movement in the older population while decreasing motor coordination resulting in falling.

Do Atropine and Diphenhydramine, Two Anti-Cholinergic Drugs, Interact to Affect Daphnia Magna Heart Rate?

Savanna Bonlender

Faculty Nominator(s): *Kelly Wonder & Tali Lee*

Daphnia magna are a type of water flea that are commonly utilized to test pharmacological and physiological responses. In this project, two common pharmaceuticals, atropine and diphenhydramine, are being utilized to test the effects these drugs have on the Daphnia heart rate. The studies that have investigated the effects of atropine on Daphnia heart rate have been contradictory, and the effects of diphenhydramine on the Daphnia heart are not well-known. According to Drugs.com, it is considered a hazard to take more than one anti-cholinergic drug concurrently. Given this, heart rate, in beats per minute, will be monitored while exposing Daphnia to increasing concentrations of atropine and

diphenhydramine independently and when administered together. The goals of this study include: to discover the effects these two drugs have on the Daphnia heart, to decipher whether an interaction occurs between the drugs when administered together, and to ultimately discover whether the Daphnia are prime subjects for anticholinergic drug testing.

Menominee Room

2:10 p.m. – 3:10 p.m.

Examining Chinese and American Climate Change Views using 2015, 2017 and 2020 Survey Data - Part I

Jesse Castellanos-Martinez, Philip Long, Lillian Roubinek, Megan Schiller

Faculty Nominator(s): *Eric Jamelske & James Boulter*

China (CH) and the United States (US) are key players in international climate change (CC) negotiations, and thus we conducted surveys in 2015 (N=7,556), 2017 (N=7,415) and 2020 (N=2,600) to better understand what Chinese and American citizens think about this very important issue. Selected survey questions were used to calculate a CC index (CCI) with higher values indicating more alignment with the scientific realities of CC. After comparing the CCI across CH and the US, we use it as an explanatory variable to investigate correlations between CC views and other outcome variables of interest continuing to provide comparisons between countries. We are looking for new stories to tell from these data, and thus have not finalized exactly what we will be presenting. Possible topics include support for the Paris Agreement, willingness to pay for CC policy action and exploring themes in open-ended comments. Throughout both presentations, attention will be given to the degree of variation in CC views in each country as well as the existence of a partisan political divide regarding CC among Americans.

Examining Chinese and American Climate Change Views using 2015, 2017 and 2020 Survey Data - Part II

Erica Kladar, Emily Krahn, Micah Link, Hannah Raddenbach

Faculty Nominator(s): *Eric Jamelske & James Boulter*

China (CH) and the United States (US) are key players in international climate change (CC) negotiations, and thus we conducted surveys in 2015 (N=7,556), 2017 (N=7,415) and 2020 (N=2,600) to better understand what Chinese and American citizens think about this very important issue. Selected survey questions were used to calculate a CC index (CCI) with higher values indicating more alignment with the scientific realities of CC. After comparing the CCI across CH and the US, we use it as an explanatory variable to investigate correlations between CC views and other outcome variables of interest continuing to provide comparisons between countries. We are looking for new stories to tell from these data, and thus have not finalized exactly what we will be presenting. Possible topics include support for the Paris Agreement, willingness to pay for CC policy action and exploring themes in open-ended comments. Throughout both presentations, attention will be given to the degree of variation in CC views in each country as well as the existence of a partisan political divide regarding CC among Americans.

Ho-Chunk Room

2:10 p.m. – 3:10 p.m.

Exploring the Chemistry of COVID-19 Severity using High-Performance Computing

Carl Fossum

Faculty Nominator(s): *Sudeep Bhattacharyay & Sanchita Hati*

The interaction between the receptor-binding domain of the SARS-CoV-2 spike protein and the human cell surface receptor was studied. Using Blugold high-performance computer-aided molecular simulations the study attempted to probe the role of oxidation and reduction on binding. The results demonstrate that oxidative stress creates a structure of the SARS-CoV-2 spike protein that binds tighter compared to the state observed in the reducing environment.

Named Entity Recognition in Unstructured Medical Text Documents

Cole Pearson

Faculty Nominator(s): *Jim Seliya*

Physicians provide expert opinion to legal courts on the medical state of patients, including determining if a patient is likely to have permanent or non-permanent injuries or ailments. An independent medical examination (IME) report summarizes a physician's medical opinion about a patient's health status based on the physician's expertise. IME reports contain private and sensitive information (Personally Identifiable Information or PII) that needs to be removed or randomly encoded before further research work can be conducted. In our study the IME is an orthopedic surgeon from a private practice in the United States. The goal of this research is to perform named entity recognition (NER) to identify and subsequently remove/encode PII information from IME reports prepared by the physician. We apply the NER toolkits of OpenNLP and spaCy, two freely available natural language processing platforms, and compare their precision, recall, and f-measure performance at identifying five categories of PII across trials of randomly selected IME reports using each model's common default parameters. We find that both platforms achieve high performance (f-measure > 0.9) at de-identification and that a spaCy model trained with a 70-30 train-test data split is most performant.

Investigation into Brain Chemistry and the Chemical Hardness of Antidepressants

Macey Smith

Faculty Nominator(s): *Sanchita Hati & Sudeep Bhattacharyay*

Antidepressants are prescribed to countless individuals worldwide to help correct the chemical imbalance within their brains, which leads to depression. In the present study, using the Blugold Super Computing Clusters, higher level calculations of energy of quantum many-body systems are being performed to determine the chemical hardness of numerous common antidepressants. Chemical hardness is an important chemical property that provides information about molecular reactivity and selectivity. The present study conducted by Ms. Macey Smith will provide an insight into the receptor molecules within the human brain that interact with antidepressants when applying the Hard-Soft Acid-Base Principle. The successful completion of this project could help in designing and developing new drug molecules that

better target the desired receptors in the brain thus, having a more direct and immediate effect on patients dealing with prolonged depression. The preliminary results of this important study will be presented by Ms. Macey Smith.

Chancellors Room

2:10 p.m. – 3:10 p.m.

Preservice Teachers' Perceptions of Children with Complex Communication Given a Parent-Reported Narrative

Anna Lash

Faculty Nominator(s): *Lesley Mayne & Karsten Powell*

An IRB approved mixed method study investigated the perceptions of preservice teachers' interpretation of communication modalities (e.g., nonverbal, eye gaze, gestures, vocalizations, use of technology) and intent of a child with a severe disability given a video clip under two conditions: (a) no prior knowledge about the child, and (b) access to a protocol completed by a parent detailing how and what the child communicates. The research questions included the following: 1) How does pre-service general and special education teachers' efficacy for communicating with an individual with a complex communication profile change after reading a parent-reported narrative about their child; and 2) Based on a video depicting an individual with a complex communication profile, how do pre-service general and special education teachers describe the individual's communication before and after reading a parent-reported narrative about the child? The research, conducted at the University of Wisconsin–Eau Claire, included 86 participants recruited from pre-service teacher education courses. Data was collected using a survey in a pre- and post-intervention approach. Quantitative and qualitative findings will be presented.

How Adverse Childhood Experiences Affect the Mental Health and Academic Performance of College Students

Andrea Peterson

Faculty Nominator(s): *Jamie Tester & Kelly Wonder*

Questions about the mental and physical health of individuals who have experienced trauma is a topic that continues to gain attention. Some areas of focus include the extent of a person's trauma, the effect of trauma on future mental and physical health, the impact trauma has on an individual's interactions with others, and the ability to form new relationships. Studies show that higher Adverse Childhood Experience (ACE) scores are directly associated with negative mental health outcomes (Chamberlain, 2020). In this study, I analyzed the content of 105 survey responses from college students to explore the self-reported impact of ACE scores on academics and relationships.

A Comparison of Creativity in the World Language Classroom before and during COVID-19

Jesselyn Nadolny

Faculty Nominator(s): *Anne Hlas*

This study investigates how the current coronavirus (COVID-19) pandemic has impacted creativity in the world language classroom. There has been recent interest on creativity within education, but little

research exists regarding creativity in the language classroom. For this reason, this research study focuses on creativity in the world language K-12 classroom by analyzing creative and uncreative artifacts self-selected by K-12 language teachers. The first set of artifacts were collected prior to the COVID-19 pandemic, in spring of 2019; the second set of artifacts were collected during the pandemic, in the winter of 2020, after several months of online teaching. The research question that guides this study is: How do creative and uncreative artifacts from pre-COVID-19 and during COVID-19 compare? In this research project, the two sets of artifacts were compared in order to draw conclusions about the potential impact of the pandemic on creativity in teaching. Initial findings suggest student collaboration decreased during the pandemic and that rote learning increased.

Session III

Centennial Room

3:20 p.m. – 4:20 p.m.

How Did COVID-19 Become Political? Evidence from Nine Internet News Websites

Miles Plueger

Faculty Nominator(s): *Peter Hart-Brinson*

There is nothing inherently political about disease, so how did COVID-19 become a hot-button political issue in the United States? This project analyzes how nine news websites covered COVID-19 between January 2020 and January 2021. The authors coded daily screenshots of the main stories appearing on the homepages of the Associated Press, USA Today, CNN, MSNBC, Fox News, The New York Times, Wall Street Journal, Huffington Post, and Breitbart and analyzed the ways that COVID-19 was associated with different political figures from both parties through headlines and images. The analysis shows that COVID-19 was covered differently by different news websites, both in quantitative terms and in qualitative terms. It was politicized early in the pandemic in February, and that there were four major peaks in coverage, culminating in the controversy surrounding President Trump becoming infected with COVID in October, right before the election. This shows how any issue can become politicized in a partisan media environment, merely by associating it with a particular individual or party.

Eulogy or Obloquy? An Exploration of Political and Public Affairs Deaths as Reported by the Major News Media

Bailey Carruthers

Faculty Nominator(s): *Peter Hart-Brinson*

When it comes to politicians' lives, can we discern where politics ends and personal lives begin? A majority of Americans believe that news organizations are politically biased, and this research was initiated to investigate partisan bias in internet news sources. Between January 5, 2020, and January 22, 2021, daily screenshots were taken from nine different news websites to capture the main headlines and images (Associated Press, USA Today, CNN, MSNBC, Fox News, New York Times, Wall Street Journal, Huffington Post, and Breitbart). This analysis focuses on the coverage of the deaths of Rep. John Lewis and Justice Ruth Bader Ginsburg. We coded all headlines and photos that had any relation to the death of both political figures. Findings show evidence of partisan bias between news sources but that the two figures were also treated differently: whereas Lewis was properly memorialized, Ginsburg's death was overshadowed by the controversy over who would replace her on the Supreme Court. Politics was

prevalent in an otherwise personal matter, thus revealing the dissipating line between professional and personal spheres.

War on Terror and International Criminal Law
Natalie Cruzat
Faculty Nominator(s): *Damir Kovačevič*

This project examines the impact of the War on Terror on International Criminal Law (ICL hereafter). It is well known that war crimes were committed by the US during the War on Terror and that few people have been punished for those crimes. While it is difficult to enforce ICL, especially on great powers, actions taken by the US to disregard and circumvent established international law during the War on Terror were particularly egregious and blatant. Much research has been done into how this happened and why enforcement was so lacking but comparatively little has been done on what impact this has had on ICL as a whole. The goal of my research would be to contribute to our understanding of the long-term impacts of the War on Terror, specifically on the field of ICL.

Menominee Room
3:20 p.m. – 4:20 p.m.

Measurement of Air Exchange Rate to Reduce COVID-19 Transmission
Danielle Zahn, Breanna Wiese, Annika Yoney, Brooke Jahner, Emily Fountas
Faculty Nominator(s): *Crispin Pierce & James Boulter*

Containing and minimizing the spread of COVID-19 remains a concern for educational institutions including UWEC where students have returned to in-person classrooms. While campuses have targeted issues of direct transmission of COVID-19 through vaccination, distancing, and masking, we have missed a vital component: ventilation. COVID19 is transmitted through aerosolized respiratory droplets, so proper ventilation and air recirculation are crucial factors in reducing the risk of transmission in indoor environments. We hypothesized that a simple, cheap, and definitive method of assessing risk of COVID-19 transmission by calculating room ventilation rate would lead to lower exposure risks. Handheld CO_2 monitors and a numerical model designed by Dr. Jose-Luis Jimenez were used to quantify rates within 25 University of Wisconsin-Eau Claire main and Barron County campus classrooms. Results led to the installation of air purifiers in 10 of these rooms, and the construction of 5 box fan filters to reduce risks. Methods developed in this project can be used to inexpensively assess potential high-risk areas, deploy purifiers, and empower college students and building managers to reduce COVID-19 transmission risks.

The Supplemental Nutrition Assistance Program-Market Match Incentive Program at the Eau Claire Farmers' Market: Comparing Utilization before and during the COVID Pandemic using Data from 2018-2021
Ethan Blaney, Kayla Irlbeck, Zach Ledwith, Tristan Shuttleworth
Faculty Nominator(s): *Eric Jamelske*

The Eau Claire Farmers' Market (ECFM) offers a Market Match Program (MMP) to incentivize Supplemental Nutrition Assistance Program (SNAP) participants to shop at the market. In 2020 and 2021, COVID-19 increased the number of families facing food insecurity. The ECFM also faced many

challenges regarding how to operate safely and households faced decisions about where/when to shop for food during the ongoing pandemic. This study employs administrative data to compare SNAP households' usage of the ECFM-MMP before and during the pandemic. We find that more SNAP households used the ECFM-MMP in 2020 compared to the pre-pandemic years of 2018 and 2019 with an additional increase in utilization in 2021. The percent of eligible SNAP households that used the ECFM-MMP at least one time in a season remained relatively constant at about 9% in 2018, 2019 and 2020, and increased to just over 11% in 2021. Our data also reveal that approximately 50% of SNAP households using the ECFM-MMP only shopped at the ECFM one time per season in each of the four years between 2018-2021.

Using Survey Data from 2021 to Explore Barriers Limiting Usage of the Supplemental Nutrition Assistance Program-Market Match Incentive Program at the Eau Claire Farmers' Market

Annabelle Howat, Katie Klingbeil, Andrew Lindaas, Madelyn Zenner
Faculty Nominator(s): *Eric Jamelske*

The Eau Claire Farmers' Market (ECFM) offers a Market Match Program (MMP) to incentivize Supplemental Nutrition Assistance Program (SNAP) participants to shop at the market. Administrative data show that approximately 90% of eligible SNAP households never use the ECFM-MMP, while approximately 50% of SNAP households using the ECFM-MMP only shopped at the ECFM one time per season. In 2021, we conducted surveys of SNAP shoppers at the ECFM (N=149) and SNAP households that did not shop at the ECFM through a mailer (N=240) to identify barriers that limited/prevented people from using the ECFM-MMP as well as what factors might increase their ability to shop at the ECFM using their SNAP benefits. The top barriers to using the ECFM-MMP were similar for both groups and included limited FM hours/locations, difficulty getting to/from FM, did not remember, can't get all food needed at FM. The factors that would increase usage of the ECFM-MMP were also similar for both groups and included a larger match amount, expanded FM hours/locations, increased awareness and reminders and mobile FM in neighborhoods.

Ho-Chunk Room

3:20 p.m. – 4:20 p.m.

Spear and Shield: Coding to Thwart Adversarial Aggression

Ariel Liu
Faculty Nominator(s): *Allison Beemer*

This project explores communication authentication and partial correction over the two-user binary real-addition multiple access channel. In particular,we investigate how efficient an encoding scheme can be while still guaranteeing protection against a malicious adversary who wishes to disrupt communications. We explore achievable rate regions both with and without an adversary's participation on the channel and give necessary and sufficient combinatorial conditions for a good codebook pair for (partial) correction of the two users' messages.

Budget/Cost Statistical Analysis and Modeling of City Greenhouse Gas Emission
Emily Liu
Faculty Nominator(s): *Jidong Zhang*

This research project will start from accounting and data analysis perspective to estimate the amount of greenhouse gas emissions in the future 5 years in Minneapolis based on the past 10 years' data and provide a model for the government to estimate the budget for reducing greenhouse gas emission. Related research on this field is relatively blank so far, and the government's needs for a budget in environment field are desperate. Our project focuses on providing a model for the government to apply when they are making a budget on controlling the emission of greenhouse gas emission. The project has practical implications to the government and non-profit organization, also contribute to academic research.

Chancellors Room
3:20 p.m. – 4:20 p.m.

It's a Wrap: Exploring Environmental Influences That Impact Youth Access to Commercial Tobacco Products
Nicole Wolfe, Grace Neugebauer
Faculty Nominator(s): *Lorraine Smith & Angie Stombaugh*

This interdisciplinary research project explored how the local business community could influence commercial tobacco use in adolescents. Our research team consisted of nursing students from the University of Wisconsin- Eau Claire, a faculty Nominator(s), and a community partner. We gathered data on environmental influences that impact adolescent's access to commercial tobacco products in Eau Claire County. A field study investigation was conducted to gather data using an abbreviated version of the Wisconsin Retailer Assessment Program (WRAP) assessment tool. From this data, we mapped all Commercial Tobacco Retailers within one mile of high schools and middle schools in Eau Claire County. Over 40 Commercial Tobacco Retailers were surveyed for advertising information, price promotions, product placement, and self-service tobacco displays. These factors largely influence adolescent's access to commercial tobacco products in Eau Claire County. This research project provides an upstream prevention focus that will lead to a healthier Eau Claire community and showcases how undergraduate nursing students can impact adolescent's health in the greater community through collaborative research efforts.

Impact of Social Support on Trauma and Self-Injury
McKenna Roessler (Co-authors: Amber Bouche, Victoria Tillotson)
Faculty Nominator(s): *Jennifer Muehlenkamp*

Childhood trauma is an established risk factor for non-suicidal self-injury (NSSI), however limited studies examine how cumulative trauma across one's life impacts NSSI frequency. Similarly, few studies assess the protective effect of cumulative social support (e.g., multiple forms of support) on the trauma-NSSI relationship. This study tested whether cumulative social support would interact with cumulative trauma, reducing trauma's effect on NSSI. Data from a random sample of 468 students with a history of NSSI (Mage = 21, 82.9% female) were collected via an online survey. Moderated regression analyses revealed that cumulative social support significantly moderated the relationship between trauma and NSSI

(t = 2.70, p < 0.005, 95% CI = 0.023, 0.149). To replicate past work, the unique effects of family, friends, and special person support were tested. Only friend support significantly moderated the effect of trauma on NSSI frequency. Cumulative social support is associated with reductions in the negative impact of trauma, but friend support may carry the greatest benefit. Including supportive others in posttraumatic interventions may help reduce the occurrence of NSSI.

Session IV

Centennial Room

4:30 p.m. – 5:30 p.m.

Forest Folklore in German Nationalism and Naturschütz

Molly Larson
Faculty Nominator(s): *Ezra Zeitler & Josh Brown*

The mythology and folklore of the German forest is deeply pervasive in German culture. It has influenced nationalist movements including the *völkisch* movement of the late-1800s, and later, anti-Semitic Nazi propaganda and some conservation efforts within the Nazi party. To what degree are these ideologies present in German culture and politics today? To further explore this topic, we conducted a literature review consisting of journal articles, books, and news articles to understand how the German forest has influenced German political geography, conservation, and nationalism throughout history and in the current day. The results suggest that the mythology of the German forest remains deeply tied to conservation efforts, the fight against climate change, and the popularity of the right-wing neo-Nazi party in Germany.

Commanding Oneself in the Information Age

Ryan Dainsberg
Faculty Nominator(s): *Matthew Meyer*

In the last 30 years, our world has changed dramatically under new power systems surrounding Information. With the ubiquity of technology and the hegemony of neoliberal logic, our ability as individuals to choose may seem free but is strategically shaped for others' political and economic ends. In order to allow people the ability to command themselves, we must make fundamental societal changes to what is reinforced in regard to obtaining and disseminating information. On an individual level, we must utilize knowledge to command ourselves to escape commercial and political manipulation. Reexamining Friedrich Nietzsche's concept of the will to power in today's world offers us some valuable insight on the choice we are posed with: to command ourselves or to allow ourselves to be commanded by others. Only by examining certain cognitive biases and overcoming documented techniques Big Information uses to manipulate our behavior can we be sure we are not commanded by others in the Information Age.

Holocaust Archaeology: GPR Subsurface Imaging of the Mila 18 Memorial in Warsaw, Poland

Noah Hall
Faculty Nominator(s): *Harry Jol*

The Holocaust was the genocide of the Jewish people and took place from 1933 – 1945. In 1943, 3 years after the construction of the Warsaw Ghetto, marked the beginning of the Warsaw Ghetto Uprising which was unsuccessful. The main insurgents of the uprising were called the Jewish Combat Organization. The headquarters of this group was located under 18 Mila Street. On May 8th, 1943, the bunker was located and gassed. Civilians inside the bunker who were unable to escape surrendered, while the fighters in the bunker committed suicide. This project aims to use ground penetrating radar (GPR) to investigate the site of the memorial in place of this event. A grid of 22m x 30m was collected in the field north of the memorial. 120 total lines were collected with a pulse EKKO Pro GPR system with antennae frequency of 500 MHz with a step size of 0.02m and a line spacing of 0.25m. The data was then processed with EKKO Project software. Within the data there are patterns approximately 1m in depth that run across the entire 30m area. There are two identical patterns that line up with the location of the infrastructure of the old Muranowska Street that existed in 1943. This could either be a sidewalk of the road or the road itself. GPR is crucial in these studies due to the clear resolution it can provide of subsurface objects. GPR can help provide a clearer picture on what lies beneath the ground and this project does an excellent job of highlighting objects in the subsurface.

Menominee Room

4:30 p.m. – 5:30 p.m.

Quantitative Analysis of Interpreter Service Mode Costs in Northwestern Wisconsin Pre- and Peri-COVID-19

Kelson Fox (Co-author: Gina Benson)
Faculty Nominator(s): *Elena Casey*

The mode of interpreter services can impact patient experiences and engagement in the healthcare system, but clinics must balance quality with costs and volume to deliver these services. In-person interactions are valuable to providers and limited English proficient (LEP) patients as they enable the interpreter "to recognize and respond to emotional and physical cues" (Jacobs et al., 2011, p. 1935). However, videoconferencing and telephone services function as lower-cost interpreter options and are effective in contexts where on-site interpreters are scarce, or LEP patients and/or interpreters are unable to travel to health care centers. The COVID-19 pandemic has generated these conditions in NWWI, necessitating social-distancing measures, stay-at-home orders, and reduced travel. Our presentation will examine how costs of interpreter services have changed overall and/or resulted in costs shifting from one modality to another for LEP patients whose first languages are Spanish, Hmong, and ASL at the Mayo Clinic in Eau Claire & Menomonie during the COVID-19 pandemic.

Burnout at Work: A Survey of Mayo Healthcare Workers and UWEC Faculty
Adamary Rosas, Parker Lay
Faculty Nominator(s): *April Bleske-Rechek*

Burnout – emotional exhaustion and callousness at work – is a concern across occupations. Various work factors, such as workload and emotional distress at work, are associated with an increased risk of burnout, whereas feeling competent at work is associated with lower rates of burnout. The current research, with student investigators Adamary Rosas and Parker Lay, was designed to extend upon past research on burnout risk. In a survey of 300 Mayo healthcare workers and 140 UWEC faculty and instructional staff, we assessed an array of work factors that have been tied to burnout, and we included personality measures in order to isolate work factors that correlate with burnout above and beyond burnout that can be explained by employees' individual personality traits. In their talk, Ada and Parker will share results on employees' degree of burnout and their perceptions of various work factors. Ada and Parker will also report on personality traits that predict burnout and which work factors, after accounting for employees' personality traits, explain additional variance in employee burnout.

Ho-Chunk Room
4:30 p.m. – 5:30 p.m.

COVID-19 Coping and Positive Outcomes
Carley Owens, Nicholas Grande
Faculty Nominator(s): *Jennifer Muehlenkamp*

Traumatic experiences, such as the Covid-19 pandemic, can bring about post-traumatic growth including strengthened coping skills, but this side of the pandemic has been overlooked. The current project examined whether individuals with perceived improvements in coping due to the pandemic would endorse fewer adverse outcomes (depression/ anxiety, self-harm, hopelessness) and greater protective outcomes (social support, self-compassion, resilience) than those without perceived improved coping. Participants were 888 (78% female) students who completed an online survey asking about coping with the pandemic and the outcome variables. Independent sample t-tests showed that improved coping participants reported significantly greater protective outcomes ($ts = 8.29$ *to* $12.99, ps < .01$) and lower adverse outcomes ($ts = 3.38$ *to* $10.79, ps < .01$). A binary logistic regression showed that lower hopelessness, self-compassion, and resilience significantly predicted membership into the improved coping group. For some, the covid pandemic has produced an opportunity for growth and improvement in one's coping abilities which was related to better psychological outcomes. Future studies of the pandemic should examine possible positive effects alongside the negative outcomes.

Nurse Training, Attitudes, Comfort, & Confidence in Suicide Patient Care
Nicholas Grande, Emma Steffel
Faculty Nominator(s): *Jennifer Muehlenkamp*

Emergency department nurses frequently treat patients at risk for suicide, but often lack sufficient training, which can negatively impact patient care. Limited research suggests suicide-specific training can improve care delivery, but the mechanisms of this effect have not been sufficiently examined. This study evaluated the hypothesis that ED nurses' confidence in caring for suicidal patients would mediate the

relationship between training and attitudes/comfort caring for suicidal patients. ED nurses from regional hospitals (n= 136, 88% female, Mage=41) were recruited through email invitations and completed an anonymous survey assessing attitudes, comfort, and confidence working with suicidal patients, and suicide training received. Bias-corrected linear regression models were run. While overall training rates were low, confidence did mediate the relationship between training and perceived attitudes/comfort (indirect effect = 0.087, SE=0.045, LLCI=.003, ULCI=.180), explaining 6% of the variance. Providing training to ED nurses for working with suicidal patients is important to ensure proper care. Additional implications will be shared.

Are Parents of a Child with Leukemia at Risk for Secondary Exposure to Chemotherapy at Home?

Maddie Jacobs
Faculty Nominator(s): *Dalete Mota*

When parents care for a child with cancer undergoing oral chemotherapy at home, there is a risk of secondary exposure while giving the medications or dealing with their bodily fluids (urine, vomit, feces, and sweat). Our objective is to investigate if caregivers receive and follow the necessary precautions to reduce their risk of secondary exposure to chemotherapy. After IRB approval, this cross-sectional study was conducted in a specialized pediatric oncology setting. Parents of children receiving oral treatment for Acute Lymphocytic Leukemia were invited to participate in the survey. Up to now, 17 individuals have participated in the study. Mothers (n=11) were the primary person giving the child's home chemotherapy, and in some cases (n=5), both the mother and the father were responsible for giving the child's treatment. Unfortunately, most reported not having received instructions related to precaution measures and did not practice these measures (e.g., using gloves to handle diapers or other child's excretions, washing child's soiled clothes with hot water). Results suggest the need to provide more thorough instructions on secondary exposure prevention.

Chancellors Room

4:30 p.m. – 5:30 p.m.

An Updated Applied Change Leadership Model Adjusted to Include EDI Measure

Amber Scharenbroch
Faculty Nominator(s): *Jane Strong & Paula Lentz*

The purpose of this qualitative research is to explore how to develop a successful change management program for use within an organization. Previous research suggests that change leadership models are key to organizational change. However, the literature fails to consider new steps that must be taken when considering change in EDI measures and how communication technologies play a role. The research will be conducted in two parts. Part one is a synthesis of literature and proposed changes to existing change leadership models. The second part researches a Fortune 500 company’s EDI initiatives on public social media platforms during January 2022 while cross-referencing the company’s corporate statement on EDI. These findings will be analyzed and evaluated on their change leadership methods. The expected outcome of this research is that organizations have an easy time taking steps to change, but they need to consider greater bounds when taking EDI initiatives. More specifically, organizations that use a change leadership

program geared to taking EDI initiatives will see greater success than those who use a regular change model.

Un-Modeling Minority Myth of Asian Americans

Angelina Lind, Yongxin Cai (Co-authors: Ziyang Xie)
Faculty Nominator(s): *Yan Li & Wayne Carroll*

Since the onset of the COVID pandemic, there has been a significant rise in anti-Asian hate crimes across the United States. This grim reality is devastating, but unfortunately not surprising to Asian communities, who have struggled with bias – or hate-motivated conduct not only related to the pandemic but throughout modern American history. In this project, we studied the nation's long history of scapegoating of Asians that goes as far back as the 19th century, revisited the roots of the model minority paradigm, and analyzed why this model minority myth was pervasive and dangerous to the Asian Americans and Pacific Islanders (AAPI) communities. By examining data in Current Population Survey (2020), a logistic regression model was fit to determine factors which were associated with each ethnic group's voting participation. We compared and interpreted differences in voting behavior between Asian Americans and other ethnic groups. Overall, Chinese Americans had a lower propensity to vote than most other Asian ethnic groups. By contrast, Asian Indian Americans demonstrated stronger voting enthusiasm.

Only Some People Can Say That: Effects of Messenger's Racial Identity on Reactions to Controversial Information about Racism in Policing

Ryan Dobson, Wesley Johnson, Kora Witthun
Faculty Nominator(s): *April Bleske-Rechek*

People are not impartial, objective receivers of information. In this student-faculty research collaboration, we investigated the degree to which people's reactions to scientific information about a controversial issue, racism in policing, are influenced by two factors: the racial identity of the messenger (black or white), and the media platform on which the messenger presents their information (MSNBC or Fox News). We hypothesize that the messenger's racial identity and political platform will interact to affect participants' receptivity to the information. We also expect individuals' own political attitudes and racial identity will moderate the effects of the manipulations. In their talk, Ryan, Wes, and Kora will describe the theoretical rationale for their research, their method and sample demographics (representative sample of U.S. adults), and the results of the analyses.

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