

2020 Symposium

Individual Abstracts – Afternoon Session

BIG DATA ON THE FARM

Presenter	Adomako, Frederick
	Graduate, Agriculture
Mentor	Prof. Aslihan Spaulding
Co-Mentor	Prof. Iuliia Tettah

Farming is undergoing a digital revolution (Bronson and Knezevic, 2016). The advent of plant genetics, chemical inputs, and more recently guidance systems have transformed the industry into one that is increasingly technology-intense and data-rich (Stubbs, 2016). In 2015, investors poured \$661 million into 84 agricultural startups to help farmers transform agriculture into the next big data industry (Pham and Stack, 2018, Burwood-Taylor, Leclerc, & Tilney, 2016). Farm machines in today's agriculture are equipped with sensors and cameras that capture field-level data like soil moisture, leaf greenness, temperature, seeding, fertilizer and pesticide spraying rate, yield, fuel usage, and machine performance (Pham & Stack, 2018). Approximately 70 percent of tractors in the U.S. have GPS with auto steering technologies and 40 percent of all corn farms can potentially use yield monitors (Schimmelpfennig, 2016).

Though big data is seen as having a lot of prospects for the agricultural sector, certain issues including who has access to the data generated and to whom the data generated belongs to is of concern. Many producers are skeptical of data storage companies allowing their data to end up in the wrong hands which has prompted discussions by a number of articles (Castle et al. 2016). Singh and Kaskey (2014) state that "big agricultural companies could now control a data trove that presents privacy and business risks to farmers who don't want to share the secrets of their trade with rivals or the government." An overwhelming majority of producers believe farm data belongs to them and them alone (Banham, 2014). This belief of ownership has resulted in much discussion of developing a farm data exchange, in which producers could be compensated for sharing of their data (Shickler, 2015; Banham, 2014; Singh & Kaskey, 2014).

The purpose of this study is to identify factors that influence Midwestern U.S. agricultural producers' adoption of big data technologies and some challenges these farmers encounter in the acquisition, use and control of these technologies for production management and agricultural decision-making purposes. Both online and mail survey were used to collected data Surveys were mailed and emailed to 620 and 11,556 farmers respectively within Illinois, Indiana and Iowa. Results of this study will add to the existing knowledge of literature and may assist stakeholders and policymakers to better understand rates of adoption of big data technologies and the concerns of farmers.

IDENTIFYING UNKNOWN SOURCES OF NITRATE IN TWO CENTRAL ILLINOIS WATERSHEDS

Presenter	Andrews, William
	Graduate, Geography, Geology, and the Environment
Mentor	Prof. Catherine O'Reilly
Co-Mentor	Prof. Eric Peterson
Author	William Andrews

Nitrate pollution is of major concern to water quality in agriculture dense lands due to fertilizer inputs, a problem that is quite significant in the Midwestern corn belt. Six Mile Creek and Money Creek in Central Illinois share near-identical agricultural land-use yet their respective municipal supply reservoirs, Lake Evergreen and Lake Bloomington, present significantly different water chemistries. Lake Bloomington is listed as impaired water by Clean Water Act § 303(d) due to periodic exceedance of the EPA's 10mg/L safe drinking water limit for nitrate; whereas, Lake Evergreen does not have that issue [4]. Lake Evergreen is surrounded by forested parkland, while Lake Bloomington's shoreline has several dozen homes that operate on septic systems, which may be a cause of Lake Bloomington's nitrate issues. The objective of this study is to explore potential sources of nitrate in each watershed and lake using nitrate isotopes $d^{15}N$ and $d^{18}O$ and to develop longitudinal nitrate concentration profiles. It is hypothesized that Lake Bloomington's nitrate concentration issues are due to inputs of septic sewage systems from the homes in the vicinity. This study will provide current and future planners a better understanding of nitrate sourcing and will help with remediation and prevention of unsafe levels of nitrate in our natural and municipal water supplies.

EFFECT OF P AND ZN INTERACTION ON SOYBEAN NUTRIENT USE EFFICIENCY AND YIELD

Presenter	Ankomah, Godfred Graduate, Agriculture
Mentor	Prof. Robinson Clay
Co-Mentor	Prof. Rhykerd Rob

The population of the world has doubled over the last 40 years to over 7 billion and the population is expected to further increase to about 9.5 billion by 2050. Agriculture production must increase in order to meet the food demands of the growing world population. Significant efforts have been made towards increasing agricultural productivity by planting improved crop varieties, improving soil fertility and adopting best management practices. Developing soil fertility strategies to enhance nutrient use efficiency has the greatest potential to increase crop yields. This study seeks to measure the interaction effect of P and Zn on soybean nutrient use efficiency and yield. This experiment will be conducted at 2 different sites in the McLean County, IL, during the 2020 cropping season. Soybean will be planted on each site and four levels each of P and Zn will be applied in combination. Split Plot Experimental Design with P being the main plot and Zn the subplot will be implemented. Biomass, nodulation and yield data of soybean will be collected. Interaction between P and Zn will be analyzed to examine the effect this interaction has on nutrient use efficiency, nodulation and yield of soybean. This research is focused on promoting synergistic interaction between P and Z which has the potential to increase soybean nutrient use efficiency and yield. Enhancing nutrient use efficiency of soybean will contribute to increasing soybean yield and reduce negative impact of fertilizer inputs on the environment.

WORKING WITH TURTLE IMMUNE CELLS AND ANTIBODIES IN THE LAB: DETERMINING EXPERIMENTAL CONDITIONS

Presenter	Araiza, Beto Undergraduate, Biological Sciences
Mentor	Prof. Laura Vogel
Co-Mentor	Prof. Rachel Bowden
Author(s)	Alberto Araiza; Micaela Ryan; Paige Farchmin; Ceara Abbott; Rachel Bowden; Laura Vogel

While much is known about the human immune system, we don't know much about reptilian immune responses. Turtles have long life spans and certainly their immune system contributes to their longevity. Our lab is interested in how turtle immunity works, so we performed experiments to test how turtle white blood cells reacted in common immune assays. First, we investigated flow cytometry and sorting in order to analyze and separate B cells. However, we found the turtle B cells appeared to die in the process, while non-B cells survived. Next, we tested two common salt solutions to see if they affected cell viability. Balanced Salt Solution is commonly used for mouse cells while Ringer's used for amphibians. We hypothesized our reptile cells would thrive better in Ringer's solution, and our hypothesis was supported. Next we tested the B cells in a functional assay to see if they could carry out the process of phagocytosis. We incubated the cells with small fluorescent beads and used flow cytometry to determine if the cells had captured any beads. Lastly, we tested the Protein G column method, a common mouse antibody purification technique, to purify antibodies from turtle serum. Our results indicated that turtle Ig did not bind to the column. Overall, our study suggests common mouse immunology methods may need to be modified for turtle cells. This work was supported by a University Research Grant (FRA) to LA Vogel, a National Science Foundation grant Grant/Award Number 1725199 to LA Vogel and RM Bowden, and a National Institutes of Health Award 1R15AI140118 - 01 to LA Vogel and RM Bowden.

BRINGING AI TO BASIC SCHOOLS IN DEVELOPING COUNTRIES: THE CASE OF GHANA

Presenter	Arko, Ernest Graduate, Information Technology
Mentor	Prof. Elahe Javadi
Author	Ernest Arko; Elahe Javadi

Artificial intelligence (AI) techniques are being employed in many dimensions of life. AI-enabled automated decision systems make decisions that were once made by people and facilitate human decision-making in numerous ways. AI-enabled systems are used in homes, healthcare, banking, transportation, schools and workplaces and they easily can generate or enable inaccurate, unfair, biased, or discriminatory decisions. Human biases of AI systems creators manifest themselves in the final system's decisions. The purpose of this study is to increase AI awareness at the foundation level and create, implement, and disseminate hands-on learning modules targeted for the middle-school kids in Ghana. We seek to diversify AI field by educating children in order to inspire future endeavors and achievements by them in the AI area. We create original material, also appropriate already existing AI education material in order to prepare middle-school kids in Ghana for future AI prospects. Currently, as part of the digitization project being held by the Government of Ghana, awareness is being made on the introduction of AI. In August 2019, the Government of Ghana with funding from the World Bank launched and trained its first cohort of AI trainees in the country. While those efforts were focused on college graduates, this project's focus is on younger generations. The effectiveness of the AI learning modules will be assessed as part of the project.

DOWNSCALING OF GRACE TWSA IN HIGHLY ANTHROPOGENIC STRESSED AQUIFER SYSTEMS; A CASE STUDY OF CALIFORNIA, CENTRAL VALLEY

Presenter	Asfaw, Dawit Graduate, Geography, Geology, and the Environment
Mentor	Prof. Wondy Seyoum
Authors	Dawit Asfaw, Wondy Seyoum

This study presents a machine learning (ML) - based downscaling algorithm that produces a higher spatial resolution groundwater level anomaly (GWLA) from the GRACE data by utilizing the relationship between Terrestrial Water Storage Anomaly (TWSA) from GRACE and other land surface and hydro-climatic variables (e.g. precipitation) in aquifers where there is significant amount of abstraction of groundwater. It hypothesizes that statically downscaling GRACE TWSA will not be viable without considering human impact in highly anthropogenic stressed aquifer systems. The objectives are to identify pumping induced deformation using InSAR and GPS data and incorporate this information and other hydrological data to produce high resolution groundwater storage maps. This helps identify depleted zones, and spatial and temporal variations of ground water storage. The method will use remote sensing techniques to identify subsidence caused by intensive pumping and machine learning to come up with a robust algorithm that predicts GWLA. The consideration of the human impact is expected to improve the accuracy of the downscaling method developed in previous studies and get relevant information about the influence of intensive pumping on the ground water storage of the study area.

FRESHWATER MICROPLASTIC CONCENTRATIONS OVER STREAM LENGTH IN CENTRAL ILLINOIS

Presenter	Babin, Jeremy Graduate, Geography, Geology, and the Environment
Mentor	Prof. Catherine O'Reilly
Authors	Jeremy Babin; Catherine O'Reilly; William Perry; John Scott

Society heavily uses plastics in a variety of applications from industry to consumer. How these plastics breakdown and persist in the environment is not well studied. Few studies have been done on the prevalence of microplastics in freshwater environments, particularly in streams without wastewater treatment plant effluent. Wastewater treatment plants are a significant point source of microplastics, but little research has been performed in streams without this input.

The goal of this research is to better understand how microplastic concentrations vary over the length of streams without wastewater treatment plant effluents. Thirty-two samples were collected from along 6 streams in central Illinois that did not have wastewater treatment plants upstream, with 4-6 samples per stream. Samples were dried and organic material was removed using Wet Peroxide Oxidation. Samples were filtered and quantified using a microscope and categorized by plastic type. FTIR was used to determine plastic type. The overwhelming majority of microplastics found were colored fibers. With no obvious source of microplastic fibers in the study area, input into these streams is likely from more diffuse sources. Further, concentration trends over stream lengths will be examined.

CHANGES IN PRESERVICE TEACHERS' SENSE OF COMMUNITY DURING UNDERGRADUATE RESEARCH EXPERIENCES

Presenter	Baldwin, Kara Graduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authors	Kara Baldwin; Bekky Darner

Science, technology, engineering, and mathematics (STEM) undergraduate research experiences (UREs) have many documented benefits including research process skills, scientific problem-solving skills, and increased interest in subject matter. Research experiences are an effective way to involve participants in the scientific process; however, the culture and social structures within laboratory spaces may impact student outcomes. UREs may occur within communities of practice (CoPs). CoPs have a continuum of individuals moving from the periphery to the center of the community. CoPs require a shared domain, a collaborative community, and a set of shared experiences. Within laboratory settings, students share a domain, they interact with peers, graduate students, and faculty, and they work toward a shared practice. To genuinely belong to a CoP, individuals must be connected to the community or be in the process of building their sense of community through 1) a sense of belonging; 2) a sense of influence and trust; 3) a sense of helpfulness; and 4) a set of shared experiences. This poster presents preliminary findings from pre-service teacher UREs. Through interviews, participants were encouraged to reflect on aspects of CoP. The poster will describe how PSTs sense of belonging changed over the course of the URE.

THE DARK TETRAD AT WORK: EXAMINING THE EFFECTS OF BOTTOM-LINE MENTALITY, JOB SATISFACTION, AND PERCEPTIONS OF ORGANIZATIONAL POLITICS ON COUNTERPRODUCTIVE WORK BEHAVIORS

Presenter	Barry, Ryan Graduate, Psychology
Mentor	Prof. Dan Ispas
Co-Mentor	Prof. Kimberly Schneider
Authors	Ryan Barry; Dan Ispas; Kimberly Schneider

Contemporary organizations often use personality measures when selecting new employees. Recent developments in the literature have shown that measures of the dark tetrad traits (narcissism, Machiavellianism, psychopathy, and sadism) provide additional benefits (incremental validity) over measures of the normal personality (Big Five) in predicting counterproductive work behaviors (CWB). This study seeks to identify factors that impact the positive relationship between higher levels the dark tetrad and CWB. We are proposing that perceptions of supervisor's bottom-line mentality (their focus on prioritizing profits over other goals) serves as a moderator, whereas one's job satisfaction and perceptions of organizational politics serve as mediators of the relationships between the dark tetrad and CWB. Implications for research and practice are discussed.

USING AFRICAN AMERICAN LANGUAGE IN THE CLASSROOM TO AFFIRM LANGUAGE DIVERSITY

Presenter

Basler, Abby

Undergraduate, Teaching and Learning

Mentor

Prof. Miranda Lin

The purpose of this study was to see how teachers can naturally integrate African American Language (AAL) into their classrooms without creating the cultural barrier that normally follows with AAL. Research shows that correcting AAL speakers can negatively impact their learning abilities (Lee, 31). Students will begin to shut down and not participate during class time. When AAL speakers are corrected, they also lose the confidence to speak in a social setting, which is crucial for language development. According to the National Council of Teachers of English, there are several goals for AAL students. For example, to value students' cultural-linguistic heritage, maintain black identity, enhance their command of Language of Wider Communication, and master critical reading, writing, and speaking skills. Many teachers have tried to incorporate the strategy of Code-Switching into the classroom. Still, research shows the Code-Switching approach implies a racist and segregationist response to the language habits of African Americans. However, the newer strategy of Code-Meshing is seen as being more effective in the classroom. Code-Meshing attempts to embrace the globalized and diverse world we live in by combining local dialects of English with Standard World English on assignments and activities inside the classroom (Lee, 166). After analyzing the literature, the implications of the study include teachers implementing code-meshing to their lesson planning by using Code-Meshing to remix a text.

Further, a positive and inclusive environment in the classroom requires more than just integrating different dialects into lesson plans. Some ideas to include AAL in the classroom are providing AAL books in the classroom library and having posters and decorations that include the African American dialect. Nevertheless, the first step to integrate AAL into a classroom is to make the students feel comfortable enough to express themselves freely, the other factors will then naturally follow. Integrating other dialects into a classroom is never easy. However, it is necessary for the success of our students.

FORMATION OF STABLE ANION RADICAL OLIGOMERS FROM THE ONE ELECTRON REDUCTION OF ALKYL ISOTHIOCYANATES

Presenter

Becerra, Zain
Graduate, Chemistry

Mentor

Prof. Steven Peters

Isothiocyanates are unique heteroallenes molecules that are derived in nature from cruciferous vegetables. These molecules have been shown to play an important role in inhibiting multiple metabolism pathways that can effectively show anti-cancer activity. With recent studies showing a correlation between high intakes of cruciferous vegetables and lower cancer rates, the need to have a better understanding of the reactivity of these isothiocyanate molecules are important.

Recently, our group has shown that isocyanates (RNCO), which are far more reactive than their isothiocyanate analogues (RNCS) due to the more electronegative oxygen, undergo rapid cyclotrimerization initiated by the one electron reduction of the isocyanate monomer (i.e., $\text{RNCO}^{\cdot-}$). The product formed is a stable isocyanurate anion radical, which has been detected via electron paramagnetic resonance (EPR) techniques. The results obtained reveal that the unpaired electron exhibits significant coupling to only two of the three nitrogens in the ring; a consequence of the unpaired electron localized in one of the carbonyl moieties. We are motivated to explore whether isothiocyanates exhibit similar chemistry upon the reduction to anion radicals (RNCS $^{\cdot-}$) in solution. Preliminary results reveal that the reduction of a solution containing alkyl isothiocyanates generate three unique anion radical species. It is also apparent that the formation of these anion radicals is much slower when compared to the results obtained from the analogous alkyl isocyanate reduction studies. We believe this is a consequence of the less electronegative sulfur atom in the isothiocyanate moiety. In this presentation, we will discuss the formation of these anion radical species and their structures as supported by EPR and NMR spectroscopic data. Density functional theory (DFT) calculations were also performed to further support the proposed structures resulting from these one electron reduction studies.

QUANTUM INTERFERENCE ENHANCEMENT OF THE SPIN-THERMOPOWER

Presenter	Bennett, Nathan Undergraduate, Physics
Mentor	Prof. Justin Bergfield

Heat can be directly converted into electricity via the thermoelectric effect in a device which has no moving parts and no operational carbon footprint. More efficient thermoelectric materials are highly sought after as energy harvesting materials and as way to understand how charge and heat interact with one another. In addition to charge, electrons carry a purely quantum property known as spin. Under the influence of an applied temperature difference, certain “spintronic” materials generate spin-dependent potentials useful for a host of applications. The interplay between spin and heat is described by the spin-thermopower, a quantity we calculate and analyze for a few interesting systems.

INDUSTRIAL AND TECHNOLOGICAL GROWTH THROUGH THE LENS OF ENVIRONMENTAL SECURITY: IS IT WORTH IT?

Presenter

Blackman, Cole

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

With photography, we can get a closer look at the technological and industrial growth we have compiled on a global level. From first glance, this is something to be proud of; growth is good. But with these advances, we have not always taken into account the effect that the operation of these systems have on ecosystems and natural resources. This compilation of photos from online sources as well as personal photographs from around Bloomington, IL will show on one side the advances there are, and on the other side will show the effects on our environmental security; followed by that will be the few advances made in recent years to combat the risks our environment now faces. Studies show that many people learn better from seeing a visual representation of events. Thus, this project's intention is to open the eyes of people to the real life risks we are facing to our environmental security, and what we can do to help.

TESTING THE RELATIONSHIP BETWEEN FEAR OF POSITIVE EVALUATION AND MALADAPTIVE PERFECTIONISM

Presenter	Bopp, Mallory Undergraduate, Psychology
Mentor	Prof. Jeffrey Kahn
Author	Mallory Bopp

Maladaptive perfectionism and social anxiety are two highly correlated constructs that involve feelings of being inadequate and fears of being negatively received by others, otherwise known as fear of negative evaluation (FNE) within the social anxiety domain. While the relationship between maladaptive perfectionism and FNE has been researched numerous times (Flett et al., 1996; Saboonchi & Lundh, 1997; Laurenti et al., 2008; Stoeber et al., 2008), less research has specifically examined maladaptive perfectionism and fear of positive evaluation (FPE).

FPE, which is another feature of social anxiety, involves fear of receiving positive feedback from others. To my knowledge, only one study (Yap et al., 2016) has included FPE and maladaptive perfectionism, and the results of this study found a positive relation between the two variables. Yet still, the relationship between FPE and maladaptive perfectionism has been consistently overlooked, which could have significant impacts on therapeutic practice and treatment of maladaptive perfectionism.

The overarching goal of this study is to examine if there is a correlational relationship between maladaptive perfectionism and FPE. This study intends to test if high standards and discrepancy, two aspects of perfectionism, share a correlational and interactional relationship with FPE.

In order to test the hypotheses of this study, students from Illinois State University registered in psychology courses will be given the opportunity to complete an online survey consisting of various questionnaires. The questionnaires, three in total, were selected based on their relevance to each of the variables of this study. The statistical tests from the results of the questionnaires will be performed through SPSS, but the specific tests have yet to be determined.

THE DARK TRIAD PREDICTED BY BELIEF IN DETERMINISM AND OBJECTIFICATION

Presenter	Boros, Rachel
	Graduate, Psychology
Mentor	Prof. Raymond Bergner
Co-Mentor	Prof. Daniel Lannin
Authors	Rachel Boros; Raymond Bergner; Daniel Lannin

The present research examines the relationship between belief in determinism, objectification, and the personality traits of the Dark Triad (Machiavellianism, narcissism, and psychopathy; Paulhus & Williams, 2002). Determinism argues that, as things are now in the present, there is only one possibility for the future. Recent research has found consequences of belief in determinism that include increased prejudice and judgment (Zhao, Liu, Zhang, Shi, & Huang, 2014), an increased likelihood to cheat and exhibit diminished moral behavior (Vohs & Schooler, 2008), and a diminished ability to learn from negative emotions (Stillman & Baumeister, 2010), that negatively influences social interactions (Genschow, Rigoni, & Brass, 2017). It is conceivable that belief in determinism may be one such belief that allows some to abrogate moral responsibility, and such may facilitate other anti-social tendencies. Objectification (seeing and ultimately treating a person as an object in a manner that dismisses that person's humanity) may be one such tendency.

Participants will be asked to complete three questionnaires via Qualtrics survey software. The Free Will Inventory (FWI; Nadelhoffer, Shepard, Nahmias, Sripada, & Ross, 2014) will measure participants' belief in free will and determinism. The Short Dark Triad (SD3; Jones & Paulhus, 2014) will measure the degree to which participants are characteristically narcissistic, psychopathic, or Machivellian. Due to the lack of an existing measure of interpersonal objectification (vs. self-objectification) in the literature, a new objectification measure was created and validated for the purposes of this study. This measure was created based on philosopher Martha Nussbaum's (1995) conceptual analysis of objectification using the seven features (instrumentality, denial of autonomy, inertness, fungibility, violability, ownership, and denial of subjectivity) that she employed to describe the phenomenon of one person treating another as an object (i.e., objectifying them); therefore the Interpersonal Objectification Scale (IOS; Boros & Bergner, 2019) will measure an individual's propensity to objectify others.

After examining psychometric properties of the objectification scale, PROCESS analyses (Hayes, 2017) will examine indirect effects in our hypothesized model via 5,000 bias-corrected bootstrapped samples. Results of these analyses will indicate whether there is a mediation effect of belief in determinism on the Dark Triad personality traits via objectification of others. Results of the proposed study will provide insight into the processes that facilitate maladaptive personality traits, and will offer guidance for interventions to minimize the development and impact of such traits.

NITRATE TRANSPORT IN THE UNSATURATED ZONE

Presenter	Bosompemaa, Patience Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson
Authors	Patience Bosompemaa; Eric Peterson; Bill Perry; Wondy Seyoum

Abundance of nitrate in the soil is a basic issue in agricultural land-use regions, causing eutrophication and pollution of water bodies. The study focuses on the role of a riparian buffer zone (RBZ) to remove nitrate from the groundwater resulting from agricultural activities. The study area is herbaceous RBZ located in central Illinois (40.614382°N, -89.023542°W), which lies between a stream and a farm located upgradient in Hudson, Illinois. The RBZ has been outfitted with an agricultural runoff treatment system that diverts the tile drainage into the subsurface of the RBZ rather than discharging into the stream. The unsaturated zone of the RBZ allows tile discharge to infiltrate into the unconfined aquifer where it then moves to the stream. The main objective of this research was to understand the role of plants in the transport and fate of nitrate in the unsaturated by addressing two hypotheses 1) during the growing season nitrate removal will be greater in the presence of plants than where plants are absent and 2) during the non-growing season, the nitrate concentration in the pore waters underlying a barren plot (no plants) will be less than in the pores underlying a plot with plants. Before growing season, the nitrate in the soil porewaters decreased with depth from the ground surface from 29.75 mg/L to 3.91 mg/l. After growing season, the nitrate concentration in the soil porewaters underlying the barren plot was 12.1 mg/L which is relatively higher than the plot with plants of 7.3 mg/L. After the growing season, nitrate concentration in porewaters underlying the plot with plants reduced from 0.42 mg/L to 0.30 mg/L and those underlying the barren plot also reduced slightly from 0.39 mg/L to 0.34 mg/L. The data indicates that nitrate is reduced once it enters the RBZ and this is probably happening due to plant uptake and microbial activity occurring within the study site hence the plant material in the RBZ could be a permanent sink.

EXPLORING THE HODGKIN-HUXLEY NEURON MODEL WITH CIRCUIT BOARDS

Presenter	Brandt-Trainer, Jordan Undergraduate, Physics
Mentors	Prof. George H. Rutherford, Epaminondas Rosa Jr
Authors	Jordan Brandt-Trainer; Zach D. Mobile; Rosangela Follmann

The nervous system is a marvelous wonder of biology which enables us, and all other animals on Earth, to, think, feel, see, hear, and otherwise sense and interact with the world around us. Its base unit, the neuron, is itself a beautiful marriage of biology, chemistry, and physics. Neurons communicate through action potential spikes, in other words, by changing the voltage across the cell membrane through the use of various ion channels and pumps which allow the diffusion and movement of mostly sodium and potassium ions, although some other ions contribute. In 1952, two scientists named Alan Hodgkin and Andrew Huxley developed a mathematical model based upon research on the squid giant axon which can simulate these action potential spikes. This model bears their name and is known as the Hodgkin-Huxley model. It is a set of coupled, nonlinear differential equations which describe the action potential by modeling the current across the cell membrane. The total current is written in terms of the current across the sodium channels, the potassium channels, and all other channels cumulatively grouped in what is referred to as a "leak" current. By accounting for these variables, one is able to produce a model which agrees well with experiment in general cases. The goal of this research is to produce an electronic circuit which is capable of simulating action potentials through the use of similar concepts, and which can also be used to communicate with other electronic neurons, just as their biological analogs do. The electronic neuron takes inspiration from the Hodgkin-Huxley model and also accounts primarily for the contributions from the sodium and potassium channels. These channels are represented by their own sub-circuits and the flow of ions is modeled through the use of MOSFET gates which open in close in coordination to replicate the action potential spike. The relative timing of these gates opening and shutting is dictated by reference voltages which are specially tuned to line up with the depolarization, repolarization, and hyperpolarization phases seen in biological neurons. In this way, the electronic neuron is capable of accurately reproducing the structure of an action potential spike in a qualitative manner. In the future, it is the goal of this project to also electronically represent the synaptic gap and allow for communication between multiple different neurons, and also to downsize the circuit and make it easily replicable and producible.

ISOLATION OF NATIVE TRNA SUBSTRATE FROM SULFOLOBUS ISLANDICUS FOR ACTIVITY DETERMINATION OF LEUCYL-TRNA SYNTHETASE PARALOG

Presenter	Bretz, Nick Graduate, Biological Sciences
Mentor	Prof. Christopher S. Weitzel
Authors	Nicholas M. Bretz; Karl R. Hellberg; Christopher S. Weitzel

Aminoacyl-tRNA synthetases (aaRSs) are ancient enzymes conserved across all domains of life. These enzymes catalyze the addition of amino acids to their cognate transfer RNA (tRNA) in a stepwise reaction referred to as aminoacylation or charging. While the majority of aaRS studies utilize in vitro transcribed tRNA molecules mimicking the endogenous tRNA, having the ability to purify native tRNA from the organism of interest can yield better substrates for in vitro aminoacylation assays. Indeed, tRNAs have the highest density of post-transcriptional modifications among all RNA species, changes that undoubtedly have the potential to affect the activity of their respective synthetase. For this study, a lithium chloride extraction method was utilized to generate a total pool of native tRNA from *Sulfolobus islandicus*. Interestingly, this organism is a hyperthermophilic archaeon with a duplication of leucyl-tRNA synthetase (LeuRS). While the canonical LeuRS, LeuRS-F, can robustly aminoacylate in vitro transcribed tRNA^{Leu}, we have yet to detect this activity with its paralog, LeuRS-I, even though this duplicate has the capacity to bind this tRNA substrate and activate leucine. We hypothesize that this discrepancy may lie in the fact that LeuRS-I relies on one or more critical base modifications on tRNA^{Leu} for activity or that this LeuRS-like protein may functionally recognize a non-cognate tRNA substrate. The use of endogenous *S. islandicus* tRNA pools allows us to determine if these predictions are viable. Results of our tRNA isolations and charging assays utilizing these tRNA pools will be presented.

SEEKING A VOICE FOR THE GENDER-NEUTRAL: INVESTIGATING PERCEPTIONS OF ARTIFICIAL INTELLIGENCE AND GENDERED INFORMATION

Presenter	Bridgemen, Kirsten Graduate, Communication
Mentor	Prof. Phillip Chidester
Author	Kirsten Bridgemen

Considering modern technology continues to permeate societal relations and has a direct influence on the social constructions of U.S. culture (e.g., gender identity), this research aims to investigate the impact Artificial Intelligence (AI) has on said culture. Specifically, this research hopes to uncover what relationships exist between current AI bodies and societal views of gender. Considering much of this research is relatively recent, the goals of this study are twofold. First, an initial pilot study will be conducted to investigate whether or not a gender-neutral voice can be achieved with AI technology. Then, a second pilot study will be conducted to discover how an AI's gendered voice can impact users' perceptions of gendered information. Results will further knowledge in research regarding perceptions of gender identity, the role of technology in the construction of identity, and more.

NATURE OF NEUTRON STAR CRUSTS

Presenter	Brokaw, James Undergraduate, Physics
Mentor	Prof. Matt Caplan

Neutron stars are small, hot, dense stellar remnants of stars that have gone supernova. They have an atmosphere, a core, and a crust. In X-ray binaries the crust begins replacing itself with accreted matter which burns explosively producing heavy elements. We simulate the compression of these elements to high densities to calculate the nuclear reactions that occur, and the heat released. We report on the evolution of variety of nuclei, and report on the heating profiles of the single composition crust. This code is being developed for distribution and is intended as an open source tool. By comparing with observations of the thermal emissions of accreting neutron stars it may be possible to determine the ages of accreting neutron stars.

SYMBIOTIC VS. NON-SYMBIOTIC OPTIMIZATION FOR SPATIAL AND TEMPORAL DEGREES OF FREEDOM IN PAIR CREATION

Presenter	Bryan, Jordan Undergraduate, Physics
Mentors	Prof. Q. Charles Su, Rainer Grobe
Authors	Jordan Bryan; Q. Charles Su; Rainer Grobe

The field-induced decay of the quantum vacuum state associated with the creation of electron-positron pairs can be caused independently by either multi-photon transitions or by tunneling processes. The first mechanism is usually induced by appropriate temporal variations of the external field while the second (Schwinger-like) process occurs if a static but spatially dependent electric field is of supercritical strength. The ultimate goal is to construct an optimal space-time profile of an electromagnetic field that can maximize the creation of particle pairs. The simultaneous optimization of parameters that characterize the spatial and temporal features of both fields suggests that the optimal two-field configuration can be remarkably similar to that predicted from two independent optimizations for the spatial and temporal fields separately [1]. This work has been supported by the NSF and Research Corporation.

[1] J. Unger, S. Dong, J. Bryan, Q. Su and R. Grobe, Phys. Rev. E 101, 013310 (2020)

PARENT AND TEACHER PERCEPTIONS OF THE IMPORTANCE OF SOCIAL-EMOTIONAL LEARNING IN THE SCHOOLS

Presenter

Calkins, Heather
Graduate, Psychology
Prof. Gregory Braswell

Mentor

This thesis presents a research project that examined the differences between parent and teacher perceptions of social-emotional learning (SEL) in the schools. This project also examined how parents and teachers rank social-emotional goals with respect to academic goals for their children. Results indicate that teachers rate the importance of SEL more highly compared to parents; however, there was no difference in how parents and teachers ranked the items overall. Qualitative analyses revealed differences in the reasoning for parent and teacher support for SEL in the schools as well as concerns for the inclusion of SEL. Future research should further investigate these differences between parent and teacher perceptions of SEL, as this could influence how SEL is presented to stakeholders and how it is implemented.

EXAMINATION OF WORKPLACE MASS SHOOTINGS WITH THREE OR MORE FATALITIES FROM 2017 TO 2019

Presenter

Caughey, Joshua
Undergraduate, Criminal Justice Sciences

Mentor

Prof. Joanne Savage

The purpose of this study is to provide a better understanding of the role of mental health in mass shootings. I analyze data from the Mother Jones Mass Shooting Data Base, supplemented with content analysis of articles published in the New York Times, Washington Post, and Chicago Tribune. The research examines the mental health of offenders in workplace mass shootings with three or more fatalities from 2017 to 2019. Indicators of mental health problems include a previous sign of mental illness, mental health diagnoses or symptoms, medication use, history of drug use, and if the offender had a history of violent behavior. The analysis of the data will provide a deeper insight into workplace mass shootings. Implications for gun control policies such as 'Red Flag Laws' will be discussed.

THE AFFECTS OF MAGNETIC PULL ON THE DYSTROPHIN GENE IN *C. ELEGANS*

Presenter

Chehak, Carlee
Undergraduate, Biological Sciences

Mentor

Prof. Andres Vidal-Gadea

Dystrophin is a gene that protects the body from injury during muscle contraction and relaxation. The effects of Earth's magnetic pull have been seen to alter the ability of the Dystrophin gene to repair itself when damaged by the Duchene muscular dystrophy mutation. Mars has a magnetic pull almost 30 times less than that of Earth's. Treating cells in a system where there is a magnetic pull similar to Mars might aid in the repair of the mutated Dystrophin genes. Using *C. elegans*, the model organism for this disease, we can test the ability of the Dystrophin gene to repair itself under the conditions of Mars. We can then compare it to those who have been under normal Earth conditions.

I SAW MY OTHER SELF AT THE ZOO: INTERNAL FOCALIZATION AND ILLUSTRATIVE SPACES IN ZOO NARRATIVES

Presenter	Cintron, Edcel Graduate, English
Mentor	Prof. Mary Jeanette Moran
Author	Edcel Cintron

The proposed poster presentation will explain how Chatman's internal focalization of narrative voices in children's texts and Nikolajeva's explanation of reading spatial aspects of illustrations in a picture book and a children's novel highlight the experiencing self of human and non-human animal in zoo narratives. The zoo can be seen as a space where humans can experience different wildlife and examine a variety of species. However, an examination of zoo narratives featured in multimodal genre, which are different types of writing composed of a range of semiotic modes, such as picture books and children's novels, narratology can offer a conversation of how and why the protagonist(s) are expressing their experiences in their stories. Thus, through the experiencing self represented in the illustrations of the picture book *Zoo* by Anthony Browne and Katherine Applegate's *The One and Only Ivan*, each of these demonstrate instances where both human and non-human animal use the zoo as a space to narrate direct or indirect positive and negative lived experiences. In addition, the main characters of each of these stories are using voice to show their own perspective through their experiencing self of going to or living in the zoo. The narrators, a little boy going to the zoo, and Ivan the gorilla, display characteristics of internal focalization, where the narrator invites their implied reader to interpret the illustrations provided by the picture book and novel to highlight a side of their life that can be interpreted as their "other." With the little boy, the reader has a glimpse of possible family abuse, and with Ivan, a representation of life as an animal taken away from his natural habitat and placed in the limited space of a mall Zoo.

EFFECTS OF NEO-TROPICAL FOREST SUCCESSIONAL AGE ON LOCAL ANT COMMUNITY COMPOSITION

Presenter	Coburn, Kaitlyn Undergraduate, Biological Sciences
Mentor	Prof. Steven Juliano
Co-Mentor	Prof. Benjamin Sadd
Authors	Kaitlyn Coburn; Steven Juliano; Ben Sadd

Conservationists have recognized the importance of the biodiversity within forest ecosystems, which contain the greatest global biodiversity compared to other ecosystems. Forests across the world are affected by natural and anthropogenic disturbances that threaten biodiversity and vital ecosystem services. Large-scale anthropogenic disturbances may result in forest regrowth known as secondary succession, however the communities in these forests are dramatically different from the old growth forests that preceded the disturbance.

The diversity of forest fauna has been used to assess ecosystem restoration and habitat quality after disturbance. Bioindicators are organisms within ecosystems used to measure an ecosystem's health and to analyze ecosystem responses to environmental disturbance. Insects are some of the most widely used bioindicators due to their important roles within their communities as decomposers, herbivores, and prey to larger animals. Ants are insects commonly used in biodiversity studies due to their diversity and dominance in nearly all terrestrial ecosystems. Ants account for a large component of rainforest animals, are associated with reintroduction of other invertebrate species, and are thus likely to be indicators of common biodiversity metrics in neotropical forest habitats. Here, we tested the hypothesis that ant species richness, diversity, and evenness will change with successional age, thus measuring and assessing successional progress beyond forest flora and plot age.

Samples of ant communities were collected to assess ant species richness, diversity, and evenness in plots of neotropical rainforest at three different ages (3yrs, 48yrs, and old growth forest [approx. 150-200yrs]), representing differing successional states. These data were gathered to measure successional progress of these plots of land and test the predictions that richness, diversity, and evenness would increase with successional age. Our data support the prediction that diversity, but not its components evenness and richness, will increase with successional age. These preliminary results support the potential for ant diversity as a measure for recovery of biodiversity during secondary succession following disturbance. These preliminary data could be expanded on by further collection to investigate the seemingly different responses of local communities affected by succession.

EXCITATION OF ELECTRODYNAMIC ANAPOLE MODES IN DIELECTRIC NANOSPHERES

Presenter	Coe, Brighton Undergraduate, Physics
Mentor	Prof. Uttam Manna

Although the study of non-radiating anapoles has long been part of fundamental physics, the dynamic anapole at optical frequencies was only recently experimentally demonstrated in a specialized silicon nanodisk structure. We report excitation of the electrodynamic anapole mode in isotropic silicon nanospheres using radially polarized beam illumination. The superposition of equal and out-of-phase amplitudes of the Cartesian electric and toroidal dipoles produces by a pronounced dip in the scattering spectra with the scattering intensity almost reaching zero – a signature of anapole excitation. Our approach provides a simple, straightforward alternative path to realize electrodynamic anapole mode at the optical frequencies that can confine energy efficiently by minimizing the radiative loss

SIMULATED MULTIFRAGMENTATION OF NUCLEAR COLLISIONS

Presenter	Coe, Brighton Undergraduate, Physics
Mentors	Prof. Matt Caplan
Authors	Brighton Coe; Ian Freeman

Nuclear collision simulations are a valuable tool for studying the distribution of fragmentation products, but generally require significant processor time to simulate. Using a simple two-body interaction model (via Dr. Matt Caplan) that treats each nuclei as a point particle significantly reduces this time while maintaining a high level of accuracy. Using this model, we prepare simulations of individual nuclei, run collisions between sets of two nuclei, and then analyze their resulting fragmentation distributions.

DEVELOPING A SYNTHETIC ROUTE TO S-CHIRAL A-N'-P-TOLUENESULFINAMIDO-L-VALINAMIDES VIA A CARBODIIMIDE APPROACH AND APPLICATION IN THE ASYMMETRIC REDUCTION OF

Presenter	Collins, Erin Undergraduate, Biological Sciences
Mentor	Prof. Shawn Hitchcock
Authors	Shawn Hitchcock; Christopher Hamacker

Chiral sulfinamides are useful templates for asymmetric synthesis due to their unique structural and electronic properties. Ellman's chiral auxiliary (enantiomerically pure tert-butylsulfinamide) has been at the forefront of much of the chemistry of the sulfinamides due to its versatility in the synthesis of chiral amines, beta-amino alcohols, and amino acids. The Ellman auxiliary is used primarily as a stoichiometric agent for diastereoselective reactions, but there is an increasing use of such compounds as chiral catalysts in enantioselective alkylations and reductions. Chiral sulfinamides are most often prepared from chiral sulfinyl chlorides. Our research group is focused on developing alternate routes to these compounds via either mixed anhydride approaches or carbodiimide approaches. Using the carbodiimide strategy, we are interested in the preparation of synthesizing a family alpha-N-sulfinamido-N-benzylvalinamides as candidates for the organocatalytic reduction of imines and aldehydes. This poster will describe our initial efforts to prepare these compounds by a process of N-sulfinamidation of the benzyl ester of L-valine. This process afforded the desired compound in a non-optimized yield of 53%. The product was chromatographed in hexanes and ethyl acetate (7:3) to afford the individual diastereomers. The late eluting diastereomer was crystalline and this made it possible to determine that this diastereomer was the (SS,S)-diastereomer. From this stage, the synthetic plan is to convert the benzyl ester to a benzyl amide. The product from this transformation would be an N-benzyl-N'-toluenesulfinyl-L-valinamide. This material will ultimately be employed as an organocatalysts in the reduction of aldehydes through the use of diethylzinc, and in the reduction of imines via trichlorosilane.

EXTERNAL FIELD APPROXIMATION FOR THE BREIT-WHEELER PROCESS?

Presenter	Comben, Sean Undergraduate, Physics
Mentors	Prof. Q. Charles Su, Rainer Grobe
Authors	Sean Comben; Q. Charles Su; Rainer Grobe

We study the creation process of an electron-positron pair as a result of the collision between two incoming photons with full spatial and temporal resolution [1]. The dynamics of the four involved particles is described by a simplified model based on a Yukawa Hamiltonian in one spatial dimension. This quantum field theoretical approach permits us to go beyond the usual external field approximation and to study the depletion of the two colliding photon wave packets due to the back-reaction of the created electron-positron pair. In this talk we critically examine the range of validity of the external field approximation. This work has been supported by the NSF and Research Corporation.

[1] Y. Lu, N. Christensen, Q. Su and R. Grobe, Phys. Rev. A 101, 022503 (2020).

TRACING LOCALIZED GROUNDWATER FLOW IN A KARST SYSTEM USING THERMAL AND GEOCHEMICAL SIGNATURES

Presenter	Conley, Ethan Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson
Author	Ethan Conley

The delineation of localized groundwater flow patterns using both thermal and geochemical data within a karst system in SW Missouri will be conducted. Thermal signatures from multiple wells (at different depths) and from several springs will be analyzed to confirm flow pathways using relationships between air temperature and water temperature. Differing relationships between these thermal signatures can differentiate distinct groundwater storage reservoirs. Previous studies suggest that deep groundwater thermal signatures present little to no relationship with air temperature, and shallow/epikarst groundwater thermal signatures correlate with the variations in air temperature. Comparing these thermal data to temperatures of waters discharging from springs can provide insightful information for the dominant source of water. Using the same wells and springs previously mentioned, several grab samples will be collected to characterize the waters geochemically. Geochemical parameters at baseflow conditions, including major cations and anions, Ca-Mg ratios, and solubility index, will allow characterization of the waters, e.g. water reservoir. Changes in these parameters from the head waters to the outlets or areas of discharge can tell us more about the potential sources and mixing that occurs within the system.

THE ASSOCIATION BETWEEN CHILDHOOD SEXUAL ABUSE, SELF-OBJECTIFICATION, AND RISK RECOGNITION

Presenter	Coventry, Michelle
	Graduate, Psychology
Mentor	Prof. Marla Reese-Weber
Co-Mentor	Prof. Jeffrey Kahn
Authors	Michelle Coventry; Marla Reese-Weber; Jeffrey Kahn

Nearly half of individuals with a history of childhood sexual abuse (CSA) experience sexual revictimization (Walker, Freud, Ellis, Fraine & Wilson, 2019). One context in which sexual (re)victimization is likely to occur is college, with freshman women at highest risk, particularly those with a history of CSA (Mellins et al., 2017; Reese-Weber & Smith, 2011). Victimization in college has been explained by deficits in risk recognition, the inability to perceive or respond to risk (Messman-Moore & Long, 2003). Given no research has explored the impact of self-objectification on risk recognition, the present study aimed to fill this gap in the literature.

At the beginning of the fall semester, participants completed online surveys assessing CSA history and indicators of self-objectification (body surveillance, body shame, and appearance anxiety). Participants also completed a task to assess risk recognition (Messman-Moore & Brown, 2006) which included reading a sexually risky scenario ending in sexual assault. Participants ($N = 335$) were freshman, undergraduate women (77.3% Caucasian, 6.6% African American, 9.0% Hispanic/Latino, 7.1 other) ages 18-25 ($M = 18.10$, $SD = .50$). Of these participants, 160 (47.85%) indicated some form of sexual abuse.

Independent samples t -tests were conducted to compare levels of self-objectification in women with and without a history of sexual abuse. Results found women with a history of sexual abuse to demonstrate significantly higher levels of body surveillance, body shame and appearance anxiety than their nonabused peers. A series of parallel multiple mediation analyses were also conducted to test whether self-objectification (body surveillance, body shame, and appearance anxiety) mediated the relationship between CSA and Risk Recognition. Specific indicators of self-objectification were found to significantly mediate the relationship between specific aspects of risk recognition (e.g., risk appraisal).

Women with a history of sexual abuse scored higher on all indicators of self-objectification, suggesting survivors of abuse habitually monitor their bodies and experience more body-related shame and anxiety than nonvictims. Given specific indicators of self-objectification were found to explain the relationship between CSA and specific aspects of risk recognition, these results can be used to inform the development of prevention and intervention programs on college campuses.

SYNTHESIS OF OXYQUINOLIZINIPORPHYRIN

Presenter	Cramer, Emma
	Graduate, Chemistry
Mentor	Prof. Timothy Lash

Carbaporphyrinoids are porphyrin analogues where one or more of the internal nitrogen atoms have been replaced by carbons. Many examples of these systems have been reported and these show diverse reactivity and spectroscopic properties. In order to further extend this field, the formation of carbaporphyrinoid systems incorporating heterocyclic subunits is being investigated. Specifically, porphyrinoids 1 incorporating a 4H-quinolizin-4-one unit were targeted for synthesis. A quinolizinone diester 2 was synthesized from ethyl 2-pyridylacetate and diethyl ethoxymethylenemalonate. Refluxing 2 with conc. hydrochloric acid afforded quinolizinone 3 and subsequent Vilsmeier-Haack formylation gave the related dialdehyde 4. Condensation of 4 with tripyrrane 5 using the MacDonald-type "3 + 1" approach gave the targeted oxyquinoliziniporphyrin 1. Proton NMR spectroscopy indicated that this novel porphyrinoid has intermediary aromatic character. Ongoing studies are being directed towards the metalation, structural and spectroscopic characterization of 1.

"OXADIAZINONES AS CHIRAL AUXILIARIES: THE SYNTHESIS OF STRUCTURALLY NOVEL OXADIAZINONE FOR USE IN THE ASYMMETRIC SYNTHESIS OF LYRICA, A DRUG USED TO TREATED PEOPLE WITH FIBROMYLAGIA"

Presenter

Delach, Christina
Undergraduate, Chemistry

Mentor

Prof. Shawn Hitchcock

"Lyrica (pregabalin) was originally FDA approved as an anti-epileptic drug, also called an anticonvulsant. It works by slowing down impulses in the brain that cause seizures. Pregabalin also affects chemicals in the brain that send pain signals across the nervous system. Lyrica is used to treat pain caused by fibromyalgia, or nerve pain in people with diabetes (diabetic neuropathy), herpes zoster (post-herpetic neuralgia), or spinal cord injury. We are trying to synthesize a molecule known as a chiral auxiliary, specifically, an oxadiazinone, for the purpose of developing an efficient synthesis of the drug Lyrica. Chiral auxiliaries are molecules that can be used to synthesize new chiral molecules. The chiral auxiliary that we are developing is based on L-phenylalanine. This poster will present the work that we have done to create the chiral auxiliary from commonly available starting materials. "

"I WANT MY DAUGHTER TO KNOW THAT DISABILITY IS OKAY:" MOTHERS' VIEW ON HER OWN VISIBLE, PHYSICAL DISABILITY AND HER CONVERSATIONS WITH HER DAUGHTER

Presenter

DeWeert, Lisa
Graduate, Communication

Mentor

Prof. Aimee Miller-Ott

Existing research argues that the closest and most significant relationship within families is the mother-daughter dyad. The level of openness between mothers and daughters often relates to the amount of commonalities and shared experiences. When a mother has a visible, physical disability or difference and her daughter does not, additional communicative challenges may arise. By exploring how mothers with disabilities or differences communicate about their differences to their daughters, this study sheds light on how women must constantly negotiate what it means to be a "good mother." Using relational dialectics theory (RDT) as the guiding framework, this current study explores communicative challenges that arise when mothers with visible, physical disabilities or differences talk about this identity to their daughters without visible, physical disabilities.

After obtaining IRB approval, I conducted eight in-depth interviews. Participants identified as a mother with a visible, physical disability or difference with a daughter without a visible, physical disability or difference. Four participants had one arm or hand, two participants used a wheelchair, and two participants had a visible skin condition. The interviews included questions about her relationship and communication with her daughter specifically about the disability or difference.

I developed three overarching themes after analysis: wonder-woman mentality (e.g., "I want to show her that it doesn't matter what you look like. You can do whatever you want"); fear of passing lessons down generationally (e.g., "I realized then how I'm not gonna be able to teach her certain things because of my limb difference"); and presence of disability talk (e.g., "You can kinda see it on her face that it was surprising to her that other kids are asking about it... it was the first time that she saw other people see me in a different way than the way she sees me").

The theoretical and practical implications of these findings are noteworthy. RDT allows for further understanding surrounding the tensions of what it means to be a "good mother." Additionally, having a daughter tended to start a transition for the mother during which she started talking about her disability or difference in ways that she had not done recently in her life. Mothers' reported that a common theme in daughters' responses to other's comments to her mom's disability was a matter-of-fact, confident energy that encouraged the moms to be more open and vulnerable in discussing their disabilities.

CONSTRUCTIVE AMPLITUDES PART I

Presenter	Diaz-Quiroz, Harold Undergraduate, Physics
Mentor	Prof. Neil Christensen
Authors	Harold Diaz-Quiroz; Neil Christensen; Justin Hayward; John Miles

The traditional method for calculating scattering amplitudes is the Feynman diagram method. However, there are significant challenges for these calculations leading to a search for a more efficient method. In this talk, we will review the motivation for searching for a new approach, some background for constructive techniques, which hope to replace Feynman diagrams, and a comparison of the two approaches for a simple amplitude.

MATERNAL STRESS EXPERIENCED IN DEVELOPMENT AFFECTS MALE HOUSE WREN BEHAVIOR IN ADULTHOOD

Presenter	DiSciullo, Rachael Graduate, Biological Sciences
Mentor	Prof. Charles Thompson
Co-Mentor	Prof. Scott Sakaluk
Authors	Rachael DiSciullo; Charles Thompson; Scott Sakaluk

It is no surprise that parents influence their young in a number of ways. Mothers in particular can pass on considerable non-genetic effects on their progeny, given their crucial role in offspring development. The physiological state of a mother (that itself is in response to the environment she experiences) can directly affect her growing offspring in a number of ways. In animals such as birds, where the embryo develops outside of the body of the mother, prenatal effects can occur in response to the mother's internal and external state both before the egg is laid (e.g., she may impart a different mixture of hormones into the yolk when stressed versus unstressed) and after (e.g., changes in incubating behavior can affect development time). To what extent these maternal effects have a lasting affect beyond nestling development is little known. To address this, we simulated stress, an important source of maternal effects, in female house wrens (*Troglodytes aedon*) by offering corticosterone (i.e., the bird stress hormone)-injected mealworms to females that had chosen a mate but had not begun egg-laying. In the following breeding season, we captured and identified the now-adult offspring of the corticosterone-fed mothers that had returned to the study site based on their uniquely-numbered leg band given to them as a nestling. To evaluate how prenatal exposure to maternally derived corticosterone affects adult male phenotype, we simulated conspecific territory intrusions and recorded provisioning effort of these returned males. We found that males whose mothers had received corticosterone-injected mealworms were both more likely and quicker to attack a simulated territory intruder compared with males of control mothers. There was no effect, however, of prenatal maternal exposure to corticosterone on how much food an adult male brought to his offspring. This study demonstrates that, indeed, a mother's exposure to corticosterone while producing eggs has transgenerational effects on some but not all aspects of the phenotype of her offspring and that these effects may be advantageous on the whole, rather than detrimental. Future work will explore the effects of prenatal exposure to maternally derived corticosterone on female adults, and well as on the grandoffspring of manipulated mothers in this study.

THE DEMEANING SOCIOCOGNITIVE ATTITUDES OF BULLIES

Presenter	Donnelly, Megan Graduate, Psychology
Mentor	Prof. Steven Landau
Co-Mentor	Prof. Daniel Lannin
Authors	Megan Donnelly; Daniel Lannin; Jeremy Kanter; Steven Landau

Current divisive political discourse evokes concern, as hostile and bullying exchanges at school have recently (and dramatically) increased. While bullying has been widely studied, less is known about sociocognitive functioning of bullies, especially concerning different types of bullies. To inform screening and intervention efforts, this study will examine sociocognitive differences in high-school-aged bullies versus bully-victims regarding their moral disengagement, normative beliefs about aggression, and social dominance orientation.

AGRONOMIC AND DEMOGRAPHIC DISCOVERY OF ILLINOIS INDUSTRIAL HEMP PRODUCTION

Presenter	Dwyer, Rebecca Graduate, Agriculture
Mentor	Prof. Nicholas Heller
Authors	Rebecca Dwyer; Maria Boerngen; Nicholas Heller

Farms and farm families across the country, especially in Illinois, are struggling financially to produce corn and soybeans. Industrial hemp (*Cannabis sativa* L.) is a new option for an economically viable crop with over 25,000 recognized end uses. Industrial hemp was legalized for production and processing in Illinois in 2019. Numerous media articles have referenced industrial hemp production as a "gateway into farming" for young adults, women, and minority groups, but there are not yet studies to support this assertion. As of 2017, only 8% of Illinois agricultural producers were under the age of 34, 29% were women, and 99% identified as white. One purpose of this study is to identify the general demographics of Illinois industrial hemp farmers. This will help us to better understand the role of industrial hemp production in increasing diversity in agriculture. For the 2019 growing season 631 individuals applied for and received a license to produce industrial hemp. This number does not include industrial hemp processors or certified labs for testing industrial hemp plants. Industrial hemp promises to be an environmentally and economically sustainable crop which is new again to Illinois - prior to the 2014 Farm Bill, industrial hemp production had been banned for over 70 years. Thus, there have been no local agronomic research trials and no published best production practices for Central Illinois. For other crops produced in Illinois, there are decades of advanced agronomic research to support farmers in making decisions such as seeding rate and depth, weed control, and insect and disease management. This lack of research in industrial hemp farming makes producer decisions difficult and is one of the many challenges faced by industrial hemp farmers in Illinois. We will conduct an industrial hemp fiber production trial over the 2020 growing season to begin reducing this problem and will focus primarily on seeding rates of fiber varieties for various end uses.

OWNER VALUATION FOR TREATMENT AND MANAGEMENT OF EQUINE ASTHMA SYNDROME

Presenter	Dwyer, Rebecca
	Graduate, Agriculture
Mentor	Prof. Michelle Kibler
Author	Jill Stowe

Equine inflammatory respiratory diseases such as recurrent airway obstruction and inflammatory airway disease were recently combined under the recommended term Equine Asthma Syndrome (EAS) (Couët il et al., 2016). The purpose of this study is to estimate horse owners' willingness-to-pay for treatment of Equine Asthma Syndrome and to determine which factors influence demand for treatment. To accomplish the research objectives, horse owner preferences will be estimated after collecting data through an online survey distributed to a sample of horse owners across the United States. We will comply with policies pertaining to the use of human subjects and the survey will be disseminated upon receiving Institutional Review Board approval.

Symptoms of Equine Asthma Syndrome can range from mild to severe and affected horses typically display clinical signs such as nasal discharge, coughing, increased respiratory rate, and exercise intolerance. Development and progression of EAS can be influenced by genetics, environmental factors, and management of the horse. Treatment of EAS requires both medication and management decisions, and treatment varies in terms of options, labor, success, and cost. Permanent dietary and environmental changes for the impacted animal are often required to effectively manage EAS symptoms. Medical treatment may be required in instances where dietary and management changes did not lead to sufficient improvement of the horse's condition. In treating EAS, horse owners must consider factors such as increased management for medication administration, improvements to performance, and potential side effects of medication. Treatment options for horses affected by EAS continue to evolve, but personal preference of the owner plays a critical role in the selection of therapies chosen to combat EAS.

Factors that have been found to influence horse owners' decisions for treating infectious upper respiratory diseases include route of administration of medication, dosage frequency, and length of recovery (Kibler et al., 2017). Experience with or concerns of drug resistance, prevalence of young horses, and advice sought from a veterinarian also contribute to the type of parasite control program utilized (Robert et al., 2015). Owners utilizing their animals for competition have been found to increase willingness-to-pay as the competition approaches to return a horse with an infectious upper respiratory illness to work (Kibler et al., 2018). We are unaware of any existing studies which examine factors affecting horse owners' treatment decisions in Equine Asthma Syndrome.

PARASITE PACKS A PUNCH: IMPACT OF SCARLET INDIAN PAINTBRUSH ON THE GROWTH OF ITS HOST

Presenter	Edmondson, Jessica Undergraduate, Biological Sciences
Mentor	Prof. Victoria Borowicz
Authors	Jessica Edmondson; Victoria Borowicz

Castilleja coccinea, commonly known as Scarlet Indian Paintbrush, is a root hemiparasitic plant native to Illinois and other areas of the central and eastern United States. As a hemiparasite, *C. coccinea* is green and photosynthetic, but grows haustoria that penetrate neighboring plants' roots to steal various types of nutrients. *Castilleja coccinea* can survive alone, however, it is not known to fully mature without having penetrated roots of a host plant. *Castilleja coccinea* is known to parasitize many vascular plant species, and scant literature suggests *Lobelia spicata*, commonly known as Pale Spiked Lobelia, is a viable host. *Lobelia spicata* is also native to Illinois prairies and other surrounding areas of the United States. We tested the hypothesis that by taking minerals, water and other nutrients from the host's xylem stream, *C. coccinea* reduces host growth and alters the host's allocation to shoot and root growth, and that *L. spicata* would be a suitable host for this particular hemiparasite. *Castilleja coccinea* seeds were added to young *L. spicata* plantlets and fertilized with either high or low concentration of fertilizer. Plants were harvested, cleaned, dried and weighed approximately 31 weeks after the addition of *C. coccinea* seeds, and the masses of roots and shoots were recorded and compared. Parasitism by *C. coccinea* significantly reduced root and especially shoot growth of the host, but the impact was dependent on the level of fertilizer. Shoot mass of *L. spicata* was depressed regardless of fertilizer level, but root mass was significantly reduced only in *L. spicata* treated with [high] fertilizer. We conclude that: (1) *Lobelia spicata* is a viable host for *Castilleja coccinea*, (2) this hemiparasite strongly reduces growth of the host, but (3) the impact of the hemiparasite on host growth depends on nutrient supply. Currently, little information about *C. coccinea*'s preferred hosts and their dynamic relationships is available, so these results add to the understanding of hemiparasite-host interactions.

IS LESS REALLY MORE? OVERCOMPENSATION RESULTING FROM MOSQUITO LARVICIDING

Presenter	Everly, Jaclyn Graduate, Biological Sciences
Mentor	Prof. Steven Juliano
Authors	Jaclyn Everly; Steven Juliano

Groundwater larviciding is a common practice implemented in Illinois to decrease populations of mosquitos in the genus *Culex*, which are vectors of diseases including West Nile Virus and St. Louis Encephalitis. The ecological consequences of larviciding, however, are poorly understood. One unintended consequence may be overcompensation, which occurs when extrinsic mortality early in development allows increased survival and reproductive ability among survivors. In the context of mosquito control, it is postulated that overcompensation could occur due to inadequate (low dosage) larviciding, leading to the emergence of large, long-lived, and reproductively-advantaged vector mosquitos. I will test this hypothesis via microcosm experiments in which *Culex* larvae are subjected to low dosages of three common larvicides with different modes of action and specificity (*Bacillus thuringiensis israelensis* (Bti) toxin, permethrin, and pyriproxyfen) sufficient to kill ~50% of individuals, plus an untreated control. Surviving adults will be evaluated for survivorship and mass (an indicator of egg production), and the microcosms will be left open to allow for oviposition and recolonization by mosquitos over the course for four subsequent weeks. This experiment will enable me to test whether mosquito larval cohorts show overcompensation in response to low larvicide dosage when compared to control and whether the production of overcompensation differs among larvicides. I will also test whether reduction of the initial cohorts and the degradation of the larvicides over time result in enhanced adult production in later cohorts of mosquitos when compared to control, and whether the larvicides differ in this delayed effect.

LOADING PROFILES ASSOCIATED WITH HIGH IMPACT PHYSICAL ACTIVITIES IN CHILDREN

Presenter Fassett, Zach
Undergraduate, Kinesiology & Recreation
Mentor Prof. Adam E. Jagodinsky
Authors Zach Fassett; Adam Jagodinsky; Carlos Santillan; David Thomas; Skip Williams

INTRODUCTION: Physical activities that involve impact loading are important for improving bone strength and bone mineral density in children. However, there is little research quantifying the impact loads associated with various high impact activities.
PURPOSE: Examine the magnitude of peak ground reaction forces (pGRF) of a variety of jumping tasks.

METHODS: Eight adolescents, within the ages of 8-12 years (age: 9.63 ± 1.49 years; height: 1.42 ± 0.08 m; mass 33.69 ± 4.81 kg), performed five trials for each jump condition. Each subject performed a broad jump (BJ), countermovement jump (CMJ), jumping jack (JJ), leap jump (LJ), and a drop jump (DJ). All jumps were performed on a force plate (1000Hz). pGRF was determined during the landing phase of each jump condition, and expressed in units of body weight (BW). A repeated measures ANOVA was employed to assess differences in pGRF across conditions.

RESULTS: DJ exhibited significantly greater pGRF (3.09 ± 0.46 BW) in comparison to the BJ (2.25 ± 0.2 BW; $P = .003$), and LJ (2.01 ± 0.1 BW; $P = .002$). LJ exhibited significantly less pGRF compared to the CMJ (2.45 ± 0.22 BW; $P = .001$), JJ (2.56 ± 0.21 BW; $P < .001$), and DJ ($P = .002$).

CONCLUSION: Vertical jumping tasks (CMJ, JJ, DJ) elicited greater vertical impact loads compared to horizontal tasks (BJ and LJ) due to the nature of landing. Previous studies indicated loads between 3-9 BW are sufficient for stimulating increases in bone mineral density in pre and early pubertal children. All conditions except DJ exhibited loading below three BW, suggesting these activities may not sufficiently stimulate bone remodeling to influence bone mineral density.

INTERNET-BASED MEDICAL DATA RENDERING AND IMAGE ENHANCEMENT USING WEBGL AND APACHE SERVER

Presenter	Fernandes, Liza Graduate, Information Technology
Mentor	Prof. Qi Zhang
Authors	Liza Fernandes; Qi Zhang

Internet-based medical data visualization has wide applications in distributed medical collaborations and treatment. It can be achieved through volume rendering technique, which is a key method for medical image exploration and has been applied to the clinical medical fields such as disease diagnosis and image-guided interaction.

In this project, we implement some medical data processing and optical mapping methods for web-based medical data visualization and image enhancement. The Web Graphics Library (WebGL) is used with JavaScript for rendering 3D graphics in a web browser. WebGL supports GPU based volume rendering which is an efficient tool for visual analysis of medical data, which involves vertex shaders and fragment shaders. The vertex shader provides space coordinates, and the fragment shader provides the color.

Network-based volume rendering is used to visualize data in a 3D form. An image processing method is implemented to transfer the 3D dataset into multiple slices of 2D image data and WebGL is employed to render 3D medical data in web browsers. Volume rendering is accomplished using the volume ray casting algorithm implemented with WebGL2. We collect new medical data and process them to fit the web-based rendering environment. The submitted work will explain the process of preparing and loading medical data suitable to be rendered. All the visualized data can be enhanced with the developed methods to emphasize the image feature of interest. We also add new control points for optical mapping and rendering medical data in a web browser in real-time. The software platform is running on Apache Web Server for network-based data visualization. The developed image enhancements and property control methods can improve medical data visualization on web browsers, which will be helpful for internet-based medical data analysis and exploration, as well as medical diagnosis and treatment.

SYNTHESIS AND CHARACTERIZATION OF RUTHENIUM-BASED COMPLEXES FOR ALZHEIMER'S DISEASE THERAPY

Presenter	Fisher, Samuel Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authors	Samuel Fisher; Stephen Mensah

Alzheimer's disease is currently an incurable neurodegenerative disorder that is characterized by the aggregation of the peptide amyloid- β ($A\beta$). Ruthenium-based (Ru) compounds have been observed to modulate the aggregation of $A\beta$, thus preventing toxicity. However, further evaluation is imperative to discern what properties of the ruthenium-compounds are most effective in preventing $A\beta$ toxicity. A small series of novel Ru complexes were prepared when changes to the ligands on the ruthenium center were applied, helping to determine their impact on $A\beta$ binding and peptide aggregation. Aggregation of $A\beta$ was monitored using a ThT fluorescence assay, dynamic light scattering, and transmission electron microscopy. The implications of this study are discussed in relation to expanding alternative therapeutic strategies for Alzheimer's disease.

VIRGIN, WHORE, OR NEUTERED: APPLYING CHICANA FEMINIST THOUGHT TO THE WOMEN OF EL TEATRO CAMPESINO

Presenter

Flores, Cheyenne

Graduate, Theatre and Dance

Mentor

Prof. Bruce Burningham

Politics in theatre is no new concept, it's discussed so vastly in every area of theatre it seems as if they simultaneously live hand in hand. However, where there is politics there is contrast. El teatro Campesino is a theatre troupe developed during the heart of the Chicano national movement in the 1960s, by founder Luis Valdez. And while the troupe holds a large cultural significance, there are some underlying issues within the group. I explore the significance of the women in El Teatro Campesino. Multiple women in the troupe were alongside the group since the beginning, fighting for the same equality as expressed in El Movimiento. But the truth lives in the title manipulation of the Chicana performer, and how cultural significance left them in an eerie position. I apply Chicana feminist terminology known as the "Vendida Logic," a significance saying that for Chicana women their own identity, sexuality, and overall character is defined as a virgin, whore, or mother. With this core ideology I apply and parallel the experiences in character and performance for the women in El Teatro Campesino to the Vendida Logic. I even come to find one more possibility for the women to be seen as neutered, neither man nor woman. The hegemonic masculine culture often washed over the presence of the Chicana performer during this extremely important period of time for Chicano/as. Manipulation of one's own identity was a mentality forced onto the Chicana actress. This paper is one to shed light on history; of the Chicana narrative, of the Chicana performance, and of the overall Chicanas in teatro during el movimiento.

THERMAL FLUCTUATIONS IN NUCLEAR PASTA

Presenter

Forsman, Cal
Undergraduate, Physics

Mentor

Prof. Matt Caplan

Authors

Cal Forsman; Matt Caplan

All stars maintain an equilibrium between the pressure in their cores and gravity compressing them. When massive stars exhaust their fuel nuclear fusion in the core ceases and can no longer support the core against gravitational compression. A core-collapse supernova occurs, and the collapsed core remains as a neutron star. Neutron stars are significantly more compact and thus much denser. At these high densities protons and neutrons rearrange into structures known as 'nuclear pasta' which are theorized to generate gravitational waves on rotating neutron stars. We study thermal fluctuations in nuclear pasta at finite temperatures using molecular dynamics simulations. We render these simulations in 3D using Paraview to study the evolution of nuclear pasta with increasing temperature. We resolve a melting transition above which the structure breaks down. At high temperatures below the melting transition various defects such as holes and filaments spontaneously form and dissolve, and we observe high surface roughness. At low temperatures defects exist but are infrequent and short lived. We characterize the surface of the pasta structures with the Minkowski functionals and find power-law deviations in surface curvature which may impact observable properties of neutron stars.

MODELING NUCLEI FOR SIMULATED NUCLEAR COLLISIONS

Presenter	Freeman, Ian
	Undergraduate, Physics
Mentor	Prof. Matt Caplan
Authors	Ian Freeman; Brighten Coe

Traditional methods of simulating nuclear fragmentations require considerable of computational resources. To combat this, we have utilized a new classical nuclear model to both reduce computational load and maintain a high level of accuracy. This model treats both protons and neutrons as point particles that only interact in two particle interactions. We have validated the model for select light nuclei, comparing nuclear binding energies we obtained from simulations and analytical calculations to experimental values. We model heavy nuclei with a body centered cubic lattice, and automatically generate stable configurations of very large nuclei to simulate collisions.

TEMPERATURE EFFECTS ON NEURONAL ACTIVITIES

Presenter	Freeman, Ian Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa Jr
Authors	Ian Freeman; Faeq Zaman

Temperature oscillations can have drastic effects on neurological systems, particularly on the capability of neurons to work in synchrony. In this work we show how temperature can contribute to neuronal synchrony and also how it can disrupt synchronous activities in neurons. Depending on the type and functional relevance of the synchronous behaviors, temperature can have stabilizing or inhibitory influences on the synchronicity. We also check for some transitions that temperature changes can induce in the neuronal output.

TEMPERATURE EFFECTS ON NEURONAL ACTIVITIES

Presenter

Freeman, Ian
Undergraduate, Physics

Mentor

Prof. Epaminondas Rosa Jr

Passive membrane current flows have an important functional role in electrical signaling in nerve cells and are often affected by temperature oscillations. Given that living organisms are subject to daily fluctuations in temperature, it becomes important to understand how these fluctuations influence the performance of neurological systems. Here we present our results of a computational study based on numerical simulations of a neuronal model where we included temperature as a control parameter. We use the FitzHugh-Nagumo set of equations to mimic the action of temperature variations on the firing rate of the neuron. We find that, within appropriate ranges, temperature increase promotes faster neuronal firing rate, and vice-versa. We also check whether temperature variations can alter neuronal firing patterns, possibly promoting transitions between tonic and bursting regimes.

DEVELOPING AN EFFICIENT ALGORITHM TO DETECT NEURONAL SYNCHRONIZATION

Presenter	Gillan, Priya Undergraduate, Information Technology
Mentor	Prof. Rosangela Follmann
Co-Mentor	Prof. Epaminondas Rosa

Synchronization is found widely in nature as for example, in schools of fish swimming in synchrony for protection against predators, in male fireflies blinking in synchrony during the mating season, and in the cycles of the Moon around the Earth. Synchronous activity is also important in the firing of neurons in the brain, which could be beneficial or harmful, depending on the type and location of the synchronization. Synchrony that is beneficial takes place in locomotion when central pattern generators work in unison to produce the appropriate gait, also in the cardio-respiratory system, and for consolidating memory. However, synchronization as a result of neurological disorders as is the case in seizures for instance, can be harmful and seriously debilitating. Our goal in this research project is to develop a better understanding of the underlying mechanisms that lead neurons into synchrony. We use a computational model consisting of a network of electrically coupled neurons. In our simulations we implement a Hodgkin-Huxley based set of equations capable of generating a wide range of neuronal behaviors. This is a model that has been applied to a number of studies including psychiatric disorders, sleep-wake cycles, temperature sensitive neuronal systems, and inhibitory coupling in neurons. The work will involve large numbers of coupled neurons, imposing a heavy load on computational processing and requiring not a small amount of computational time. In order to reduce processing times we use high-performance computing techniques which includes parallel processing. A preliminary implementation of our computer code applied to a small network of neurons shows promising results. We have been able to check how the strength of the coupling reflects of the synchronous behavior of the neurons. Also, we have observed that individualized fast neurons surrounded by slow neurons can generate waves of synchronization that travel through the network. The knowledge gained in this research work may help develop methods that enhance desirable synchronization and, at the same time, create techniques that hinder undesirable synchronization.

DIRAC VACUUM CAN RESOLVE RAPIDLY CHIRPED EXTERNAL FIELDS

Presenter	Gong, Chi Undergraduate, Physics
Mentors	Prof. Q. Charles Su, Rainer Grobe
Authors	Chi Gong; Q. Charles Su; Rainer Grobe

We study the dynamical response of the Dirac vacuum state to a very strong time-dependent electric field pulse, whose frequency is chirped in time [1,2]. The resulting field-induced electron-positron pair creation process can be used to examine various proposals for time-dependent frequency spectra of the external field. It turns out that the Dirac vacuum can be used as sensitive probe that can respond to the instantaneous values of the frequency at each moment of time by producing electrons with the appropriate energy. This almost instantaneous response feature of the vacuum state permits us to introduce a new generalized rate-equation. It is based on the concept of a time-dependent decay rate and can provide semi-analytical solutions to predict the number of created electron-positron pairs during the interaction with arbitrary chirped electric field pulses. This work has been supported by the NSF, Research Corporation, and the China Scholarship Council program.

[1] C. Gong, Z.L. Li, Y.J. Li, Q. Su and R. Grobe, Phys. Rev. A (submitted).

[2] C. Gong, A. Penwell, Z.L. Li, Y.J. Li, Q. Su and R. Grobe, J. Opt. Soc. Am. B (in press).

EFFORTS TOWARDS THE TOTAL SYNTHESIS OF TOXICODENANE A

Presenter:	Grabowski, Jake Graduate, Chemistry
Mentor	Prof. T. Andrew Mitchell
Co-Mentor	Prof. John Goodell
Authors	T. Andrew Mitchell; John Goodell; Jake Grabowski

Cycloadditions are valuable synthetic tools, providing access to complex three-dimensional polycyclic structures from planar precursors. The Mitchell group has reported differing reactivity of acetoxy-pyranones in the investigation of base-mediated oxidopyrylium-alkene [5+2] cycloadditions. Cycloadditions proceeding via thermal activation of silyloxy-pyrone-alkenes are also efficient routes toward bridged polycyclic ethers and related ring systems present in biologically-active compounds. Consequently, exploration of oxidopyrylium [5+2] cycloadditions directed toward the synthesis of these classes of compounds is warranted. Toxicodenane A (I), a tricyclic sesquiterpenoid isolated from the dried resin of *Toxicodendron vernicifluum*, possesses a bridged polycyclic ether core whose construction can be envisioned by this powerful reaction. Thus, we propose a synthesis of Toxicodenane A to demonstrate the utility of oxidopyrylium [5+2] cycloadditions as concise and reliable reaction pathways in the context of natural product total synthesis.

SEASONAL INPUTS AND DISTRIBUTION OF MICROPLASTICS IN LAKES BLOOMINGTON AND EVERGREEN

Presenter

Grant, Joseph

Undergraduate, Biological Sciences

Mentor

Prof. Bill Perry

Water pollution is a major issue for everyone and the clean water act 1972. is now faced with an emerging new contaminant, microplastics. The extent of microplastic pollution in marine environments has been well documented, but initial studies of freshwater systems suggest they have higher microplastic concentrations. Midwestern reservoirs, including lake Bloomington and Evergreen, are used as municipal water supplies and microplastic contamination has the potential to be a major issue. The goal of this project was to assess the timing, magnitude and distribution of microplastic contamination within Therefore, my project focused on drinking water reservoirs lake Evergreen and lake Bloomington in McLean County Illinois. I hypothesized that inputs of microplastics would be highest during high flow periods and lower during summer low flow conditions. Because reservoirs differ from natural lakes buy having a large inflow. To document the timing of microplastic inputs we sampled in June and in October? That corresponds to periods of low and high flow respectively. To document the distribution within the lake I sampled There were 14 locations evenly distributed throughout each lake at a depth of 0.5 meters. To isolate microplastics, after sampling peroxide oxidation removed organics leaving only microplastics. To separate microplastics from inorganic sediments a 6g/20mL concentrated salt solution was used to float the lighter microplastics. The salt solution was then filtered on a 0.45 um filter to allow enumeration of microplastics under a dissecting scope at 10-40x magnification. The Microplastics were separated into two broad categories: which were fibers and fragments, red, yellow, orange, green. While the dark category was comprised of, blue, purple, and black plastics. There were significantly more microplastics in the lakes during the high flow season, June, compared to the low flow season. Further, microplastic concentrations were high near the inflow compared to the outflow areas of the lakes. The lakes were not significantly different which interesting as the watershed sizes are different and the urbanization is different in the two. These results are far lower than in marine environments These results suggest inflowing streams are the major source and not local housing inputs Our data will help inform water plant operators that these water sources are as contamination or more contaminated than ground water sources and when extra treatment efforts are needed

INVESTIGATIONS INTO THE SYNTHESIS OF 2,4-QUINIPORPHYRINS

Presenter	Graybeal, Alexis Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authors	Alexis Graybeal; Timothy Lash;

Carbaporphyrins and related systems replace one or more of the nitrogens of the porphyrin cavity with carbon atoms. Many examples of these systems are known, including benziporphyrins and naphthiporphyrins that incorporate benzene or naphthalene subunits, respectively. In this project, carbaporphyrinoids incorporating quinoline subunits (1) have been targeted for investigation. In these structures, a nitrogen has been reintroduced but placed at the periphery of the structure. A series of quinoline diesters 2 have been prepared and reduction with diisobutylaluminum hydride at -70 °C afforded the related dialdehydes 3. In addition, a tripyrrolic intermediate 4 (tripyrane) has been synthesized so that the new porphyrin analogues can be generated using a "3+1" methodology. Preliminary investigations into the formation of quiniporphyrin derivatives 1 are currently in progress.

SYNTHESIS OF OXYQUINIPORPHYRINS

Presenter	Gudeman, Cyrus Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authors	Cyrus Gudeman; Timothy Lash

Benziporphyrins and naphthiporphyrins are porphyrin analogues where one of the pyrrolic subunits are replaced by benzene or naphthalene moieties, respectively. Although these porphyrinoids are nonaromatic, hydroxy-substituents tautomerize to generate aromatic oxybenzi- and oxynaphthiporphyrins (e.g. 1a). In this project, quinoline subunits are being introduced to give analogous heterocyclic macrocycles that have the potential to generate unusual organometallic derivatives. 8-Hydroxyquinoline (2a) was reacted with formaldehyde under alkaline conditions to afford a dialcohol that was oxidized with sodium chromate to produce dialdehyde 3a. An alternative route to the isomeric dialdehyde 3b from 5-hydroxyquinoline (2b) is also under development. In addition, a tripyrrolic intermediate 4 has been prepared so that the targeted oxyquiniporphyrins can be prepared using the "3 + 1" version of the MacDonald condensation. It is speculated that the porphyrinoid cavities can be metalated to give organometallic derivatives and that the orientation of the external nitrogen in oxyquiniporphyrin 1c may also allow the formation of pincer complexes 5.

"THAT'S WHAT SHE SAID": BREAKING THROUGH OVERT SEXISM

Presenter

Haas, Blake
Graduate, Communication

Mentor

Prof. Joe Blaney

Though previous literature has explored sexual humor in office environments, professional settings, and other settings where professional behavior is critical, minimal attention has focused on the media usage of overt sexism in office environments. Drawing from Expectancy Violations Theory and Grounded Theory, this study explores overt sexism in *The Office*. Although fictitious in nature, results indicate male colleagues use "that's what she said" jokes to flex their over sexist muscle, making female colleagues the victim of the joke in office environments. Additionally, this study determines that verbal and nonverbal responses to Michael Scott's longstanding joke to determine how sexual humor in real office settings could carry implications.

CORRELATION BETWEEN LOCAL MOVEMENT STRENGTH AND MUSCLE RANGE OF MOTION

Presenter	Haggerty, Stephen Graduate, Kinesiology & Recreation
Mentor	Prof. David Thomas
Authors	Stephen Haggerty; David Thomas; Kelly Laurson; Dale Brown

Hamstring injuries are often one of the most common injuries in sports. These injuries have been frequently linked to lack of range of motion and weakness.

Purpose: To investigate the relationship between knee and hip strength with hamstring range of motion in male college athletes.

Methods: 60 male collegiate athletes ages 18-24 will be recruited to participate in this study. These participants will be asked to perform muscle strength tests for hip flexion, hip extension, knee flexion, and knee extension, on both legs, measured with a hand-held dynamometer. The assessments will be isometric contractions of the specific muscle groups for 3 seconds with 60 seconds rest. Each movement will be tested twice, and the highest value will be recorded. They will also perform two assessments to measure active range of motion of the hamstring muscles, the active straight leg raise and the active knee extension. The range of motion of these assessments will be measured with a digital inclinometer.

Results: It is hypothesized that there will be a relationship between the ratio of strength in hip extension to hip flexion and hamstring flexibility; the higher the ratio of these two strength measurements, the lower the range of motion. The stronger one's hip extension is compared to their hip flexion strength, the less range of motion we would expect to see.

Conclusion: We expect that this relatively simple method for assessing hamstring range of motion and lower limb strength could be used to determine other ways to improve hamstring range of motion and lower injury risk.

THE SHALWAR KAMEEZ: PAKISTAN'S PERSIAN-INFLUENCED NATIONAL GARMENT

Presenter

Hamzeh, Shahrzad
Graduate, Theatre and Dance

Mentor

Prof. Lauren Lowell

This paper will begin by going through the reasons why Shalwar Kameez, which means "trousers and tunic," is Pakistan's national garment. The paper will investigate the religious reasons why this outfit is preferred amongst Muslims of the subcontinent of India. It focuses on the history of Shalwar Kameez in Pakistan. The garment started as a fashion during the Moghul era when the Moghuls were ruling over the Persian Empire which included the Indian subcontinent and modern day Pakistan. Ultimately this paper will argue that the national garment of Pakistan is a Persian influenced item of clothing, and it continues to be popular among people of the subcontinent of India.

BELLY DANCING AND THE FORGOTTEN HISTORY OF PERSIAN DANCE

Presenter

Hamzeh, Shahrzad
Graduate, Theatre and Dance

Mentor

Prof. Bruce Burningham

This paper will discuss the differences between Belly dancing and Persian dancing while focusing on the particular history of Persian dance. Not only has Persian dance not gotten the same attention as belly dancing, but in some cases the entire style has been mistaken for belly dancing. The paper will begin with a short history of what might have caused the confusion of considering the two dance forms to be the same. It will also examine visual differences such as those related to costuming and technique. Ultimately, the paper will argue that Persian dance is fundamentally different and independent from Belly dancing, and that the absence of available histories of Persian dance has left a vacuum in the documentations on dances of the Middle East, which has led to the belief that Belly dancing is all there is.

FIRM'S COMMITMENT TO EMPLOYEE SATISFACTION AND CAPITAL STRUCTURE DECISIONS

Presenter	Haque, Sirazum Munira Graduate, Economics
Mentor	Prof. David Cleeton

According to the Modigliani-Miller theory (1958) of capital structure, financial leverage produces an increase the value of a firm by reducing the weighted average cost of capital via a tax shield. Titman's stakeholder theory (1984) extended the capital structure model incorporates the impact of nonfinancial stakeholders (i.e., customers, suppliers, employees) on a firm's financing decisions. Fahn, Merlo, and Wamser (2019) developed a theoretical model to include the possibility that firms with a high level of relational commitment toward their employees maintain low debt level even under conditions of very low bankruptcy risk. In this paper, I examine the empirical implications of the Fahn et al. (2019) theoretical model focusing on whether companies with higher levels of employee satisfaction maintain higher levels of equity in their capital structure. To analyze this question, I use data from the Fortune magazine's ratings for the "100 Best Companies to Work For" and create an index of employer-employee commitment, together with firm-level financial information from Compustat over the period 2016 to 2019. The analysis relies on ordinary least square regression methods allowing variation across time and companies. If the hypothesis of Fahn et al. (2019) can be corroborated with firm-level data, we can gain additional insight in the financing decisions behind many successful contemporary companies.

DOCUMENTING GREENSPACES IN PHILADELPHIA

Presenter	Hardin, Seth Undergraduate, Geography, Geology, and the Environment
Mentor	Prof. Alec Foster
Authors	Seth Hardin; Alec Foster

Studies have shown that having access to green space areas are important to overall well-being and can reduce health inequalities. We documented and mapped existing greenspaces in the Olde Kensington neighborhood of Central Philadelphia near Temple University. With the gentrification and recent development boom in this area of Philadelphia, there have been many greenspaces that have been destroyed and built upon to make room for new residences.. By utilizing Google Earth and recent satellite imagery, we digitized greenspaces within the study area parcel by parcel and applied their existing parcel and address data. We also included whether the greenspaces were on commercial, resident, or vacant lots, as there is a significant amount of vacant lots in the neighborhood.. In August of 2019, we visited the study site in Philadelphia to conduct field work by ground truthing our results and observing if any greenspaces had been added or lost from the date of our satellite imagery. Using ArcMAP, Google Earth, and Adobe illustrator, we created a map with the current existing greenspaces found from our research as well as the amount of schools, community centers, and churches within the study area. We found 531 greenspaces in our study area, totaling 16.98 acres, or 7.9% of the total study area. The average area per greenspace was 0.032 acres, while the largest greenspace had an area of 1.33 acres. This study represents the first phase of a long-term research project in Philadelphia, by documenting the current greenspaces in this rapidly changing neighborhood, residents and policymakers can work to ensure that they are preserved as new development occurs. Future research will examine how changes in greenspaces over time relate to shifting neighborhood demographics. The methodology developed for this study can be replicated in other locations to study rapid urban socioecological change.

SELECTIVE PERCEPTION IN PROBING BY FOOT: PERCEIVING THE LENGTH OF A PROBE AND THE DISTANCE OF A SURFACE PROBE

Presenter	Hartling, Stephanie Graduate, Psychology
Mentor	Prof. Jeffrey Wagman
Author	Jasmine Mason

Perceiving properties of a wielded object or perceiving properties of a surface probed with a wielded object are both examples of perception by effortful or dynamic touch. When participants use a hand-wielded rod to probe a surface, they can direct attention to either the length of the rod or the distance of the probed surface. In each case, perception of the intended property is supported by detection of different invariant mechanical parameters. Invariance implies both task-specificity and anatomical independence of perception. We investigated both phenomena in the two experiments reported here. Participants used a foot-wielded rod to probe a surface and reported the length of the rod and the distance of the surface probed (on separate sets of trials). The ability to differentiate these properties generalized across anatomical components, and perception of each property was supported by analogous sensitivities to the same invariant mechanical parameters across anatomical components. The results are discussed in terms of haptic perception as the assembly of a smart perceptual instrument and the haptic system as a biotensegrity structure

MORTALITY PREDICTION UNDER STOCHASTIC FRAILITY

Presenter	Hasan, Kazi Tanvir Graduate, Mathematics
Mentor	Prof. Olcay Akman

When mortality statistics are reported for infectious diseases, they commonly reflect the ratio of the population impacted from it. Quite often this causes an underestimation since as frail members of the population are removed, the remaining healthy ones skew the disease by lowering the mortality. With this project, we study predicting mortality under varying frailty conditions to remove the hidden heterogeneity's impact from the parameter estimates.

A NA,K-ATPASE WITH REDUCED STOICHIOMETRY IS VITAL FOR BRINE SHRIMP ADAPTATION TO HIGH SALINITY

Presenter	Hatcher-Moorman, Jasmine Graduate, Biological Sciences
Mentor	Prof. Craig Gatto
Authors	Jasmine Hatcher-Moorman; Dylan Meyer; Victoria Young; Jessica Eastman; Matthew Birk; John Rosenthal; Craig Gatto; Pablo Artigas

Brine shrimp (*Artemia salina*) are osmoregulators that survive in ~4.5 M salt. They express two Na/K pump isozymes formed by different α -subunits associating with a common β -subunit; a "normal" α -subunit (α 1NN) or a special α -subunit (α 2KK) containing two asparagine-to-lysine substitutions in the ion-binding region.

We introduced the equivalent substitutions (N333K and N785K) in the *Xenopus* α 1-subunit and functionally evaluated the mutants with electrophysiology in *Xenopus* oocytes. N785K reduced apparent affinity for K⁺. Both individual mutants reduced Na⁺ apparent affinity. The ion affinity change observed in N333K/N785K was not the sum of individual mutants' effects, indicating these residues are coupled.

Simultaneous determination of ⁸⁶Rb⁺ (a K⁺ congener) uptake and charge extruded under two-electrode voltage clamp yielded ratios of Rb⁺ uptake/charge extruded of 2.11±0.07 (n=40) for WT and 1.07±0.04 (n=21) for N333K/N785K, indicating stoichiometries of 3Na⁺:2K⁺ and 2Na⁺:1K⁺, respectively.

Inhibition of α 1NN by ouabain (IC₅₀~100 μ M) reveals a ~ten-fold lower affinity than α 2KK inhibition (IC₅₀≤10 μ M) (Cortas et al. *J. Memb. Biol.* 108:187-195, 1989). The LD₅₀ for larvae (nauplii) incubated for 24-hr in ouabain was LD₅₀~300 μ M at 0.12 M and LD₅₀~30 μ M at 2 M salt, indicating that α 2KK Na/K pumps are required for high-salinity adaptation.

We reared *Artemia* at 0.25 M, 2M and 4 M salt to quantify the changes in mRNA expression at different salinities using transcriptome analysis and qPCR. Compared to animals in 0.25 M, *Artemia* at 4 M salt increased expression of α 2KK (≥10-fold) and β (~2-fold) while α 1NN expression remained unaltered.

Immunostaining of salt-extrusion organs and guts of adult *Artemia* show exclusive basolateral Na/K pump localization. Therefore, the need for a reduced stoichiometry must come from an extreme basolateral membrane voltage, probably required to extrude Cl⁻ passively by mechanisms under investigation.

CONSTRUCTIVE AMPLITUDES PART II

Presenter	Hayward, Justin Undergraduate, Physics
Mentor	Prof. Neil Christensen
Authors	Justin Hayward; Neil Christensen; Harold Diaz-Quiroz; John Miles

The traditional method for calculating scattering amplitudes is the Feynman diagram method. However, there are significant challenges for these calculations leading to a search for a more efficient method. In this talk, we will describe our current progress with new calculations of scattering amplitudes in quantum electrodynamics using the new constructive techniques.

NATURAL NITRATE REMOVAL IN SHALLOW SUBSURFACE STREAM FLOWS

Presenter	Heath, Abigail
	Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson

While naturally occurring and necessary to ecological production, excessive quantities of nitrate are added to the environment via anthropogenic means, especially in the Midwest, where more than half of land use is cropland. Excess nitrogen from nitrate can cause algal blooms, leading to anoxic zones in aquatic environments and to health complications, such as blue baby syndrome. This study will determine the extent of surface water-groundwater interactions between the stream and subsurface environments and how they contribute to nitrate movement through the environment by : (1) conducting tracer tests in a stream to determine the flowpath of the water and (2) analyzing the chemical composition of the stream water, groundwater, and water flowing through the hyporheic zone (HZ) , a shallow subsurficial mixing zone below streams, from spring to fall. It is hypothesized that stream water and groundwater contribute proportionally inverting amounts to water flow through the depth of the hyporheic zone and that the chemistry and oxygen content of this mixed zone allows for significant nitrate removal from water in the HZ. A better understanding of how different water sources contribute to the HZ and how that water flows through this zone will better equip regulators and remediators to use streams and their hyporheic zones to remove excess nitrate from agricultural runoff, contributing to healthier ecosystems and drinking water.

DETERMINATION OF TRNA AMINOACYLATION ACTIVITY BY LEUCYL-TRNA SYNTHETASE PARALOGS FROM AN ARCHAEON

Presenter	Hellberg, Karl Graduate, Chemistry
Mentor	Prof. Christopher S. Weitzel
Authors	Karl R. Hellberg; Christopher S. Weitzel; Nicholas M. Bretz; Kristen K. Eilts; Ally Bergh; Ethan Oliver; Logan Ziegler

Aminoacyl-tRNA synthetases are vital to protein synthesis. These enzymes attach amino acids to their cognate tRNA/s in a two-step aminoacylation, or charging, reaction. Interestingly, within the Sulfolobaceae, a family of Crenarchaeal extremophiles, a duplication of leucyl-tRNA synthetase (LeuRS) has been conserved and maintained. One paralog, LeuRS-F, maintains canonical activities of the LeuRS family of enzymes, binding *in vitro* transcribed tRNA^{Leu}-UAG, activating leucine, and transferring this activated amino acid onto its tRNA substrate. However, the duplicate, LeuRS-I, while maintaining the former two activities, has seemingly lost the ability to charge tRNA^{Leu}-UAG. In *Sulfolobus islandicus*, one member of this Archaeal family, five tRNA^{Leu} isoacceptors, different tRNAs that bind to alternate codons for the same amino acid, exist along with an additional pseudo-gene with tRNA^{Leu}-like sequence identity. The four remaining isoacceptors and pseudo-tRNA were cloned using overlapping oligonucleotides and synthesized via T7 RNA polymerase-directed *in vitro* transcription of DNA templates derived by polymerase chain reaction (PCR). To test these substrates, the synthetase paralogs were overexpressed in *Escherichia coli* and purified by affinity chromatography. The aminoacylation activity of these proteins toward this set of leucine tRNAs was monitored using tritiated leucine. Results from these experiments are presented and discussed herein.

DISCARDED FROM MEMORY AND HISTORY: THE INDIAN SOLDIERS OF WORLD WAR II

Presenter	Hixson, Daniel
	Undergraduate, History
Mentor	Prof. Sudipa Topdar

The Second World War has forever implanted itself within popular memory and history. What is little known, though, is that forced into war by the colonial British empire, India contributed an army of 2.5 million soldiers (the largest volunteer force) to the Allied forces and fought globally against the Axis powers. India's involvement in the war has largely been displaced by an American and Eurocentric narrative of events. Historians, too, have overlooked the physical and psychological struggles of the Indian soldiers that fought in the war.

My research underlines memory as an outcome of both remembering and forgetting, and of the preservation and recovery of historical records. I pivot our attention to the discarded history of the Indian soldier in World War II to ask how does memory shape history writing? What was the role of the Indian soldier in World War II? Were any opportunities awarded to Indian soldiers for their efforts? How did Indian nationalists debate India's participation in the war to fight for an oppressive British empire? Why has the history of the Indian soldier been forgotten and how does power dictate whose history gets written? Finally, how does the act of forgetting and erasing certain historical actors racialize the writing of history?

My research is based on Raghu Karnad's "*Farthest Field*" (2015), an award-winning memoir novel that explores his grandfather and two great-uncle's experiences during the war. Using the novel and contemporary historical photographs of WWII, I explore the complexities of British and Indian relations shaped by racial and colonial tensions. I argue that Indian soldiers played a crucial role in World War II including successfully repelling a ruthless Japanese invasion in the China-Burma-India theatre. The British empire not only used Indian soldiers with blatant disregard for their lives and humanity, but also replaced the sacrifices of Indian soldiers from history with a narrative solely focused on European bravery and victory. The ideological conflicts amongst Indian soldiers over fighting for their colonial oppressors further complicated their motives for fighting, even spawning a rebel faction - the Indian National Army.

These issues are of contemporary significance because of current debates on films/media "forcing diversity" by showing Indians fighting alongside British forces, and on the vandalism of a memorial to Indian soldiers of both World Wars in the UK. These examples showcase the lasting implications of forgetting this history and imbibing its deeply racialized variant.

EFFECT OF TASK DELAY ON TASK ORDER CHOICES

Presenter	Huang, Mu-Jen
	Graduate, Psychology
Mentor	Prof. Dawn McBride

Recent studies have found an interesting psychological effect where people have a tendency to complete the task as soon as possible, even this might involve extra physical effort. This is known as pre-crastination (Rosenbaum et al., 2014). Pre-crastination is affected by current memory load capacity (Fournier et al., 2019), as suggested by the Cognitive-load-reduction (CLEAR) hypothesis (VonderHaar et al., 2019). The CLEAR hypothesis suggested that people have a strong tendency to offload intentions to free up their cognitive resources for other tasks. The CLEAR hypothesis suggested that clearing items from a mental to-do list allows us to better prepare for more cognitively demanding tasks.

To further extend this concept, in the current study, we hypothesized that individuals who had limited working memory capacity would be restricted in cognitive resources, and when they encounter cognitive demanding tasks, which they are more likely to pre-crastinate. In addition, considering the urgency to offload an intended task, we assumed that a longer delay before the task begins creates a stronger tendency to pre-crastinate. The current study uses the box moving task used in VonderHaar et al.'s study to measure the pre-crastination rate. Participants will be randomly assigned to different delay conditions (0s, 15s, 30s) throughout six box moving trials. In some trials, they will be assigned to memorized three-digit numbers as an additional memory burden across the trial. We will also measure two types of cognitive functions that are essential for pre-crastination: inhibition and monitoring. These cognitive abilities will be measured separately from the box moving task by two well established psychological tests, which are the Stroop test (inhibition) and the N-Back test (monitoring). We predict that people who have higher cognitive function ability, as measured by these tasks, will be less likely to pre-crastinate.

CORN AND SOYBEAN CROPPING SYSTEMS: PROFITABILITY OF DIFFERENT AGRONOMIC MANAGEMENT TECHNIQUES

Presenter	Huffman, Raeann Graduate, Agriculture
Mentor	Prof. Nicholas Heller
Authors	Raeann Huffman; Nicholas Heller

The environmental impact of current production agriculture operations in Illinois and across the corn belt have attracted attention in many studies. These studies point out the nutrient over application that then leaches off the farm and the negative impact monocultures have on biodiversity. The modern agriculture industry focuses largely on efficiencies on a large scale and on yield, but not on farm profitability. Operations are dependent on costly inputs such as seed, fertilizers, herbicides, fungicides, insecticides, and machinery costs. Despite rising yields, the current system is not sustainable and has resulted in a concomitant continued rise in farm bankruptcies. We propose alternative practices including intercropping which is a sustainable practice that can improve resource-use efficiency, such as nutrients and water, allowing low input agricultural systems. A system that reduces inputs and those associated costs may help increase operational profitability. The current study will evaluate cropping system specifics including row spacing, row orientation, seeding population, and intercropping and their impact on profitability which may offer producers a sustainable alternative to monocultures.

INVESTIGATIONS INTO THE SYNTHESIS OF PORPHYRIN ANALOGUES FROM AZULITRIPYRRANES

Presenter	Johnston, Rachel
	Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authors	Rachel Johnston; Timothy Lash

Due in part to their importance in nature, porphyrins have been synthetically investigated to determine their properties and potential applications. Azuliporphyrins 1, porphyrin analogues that possess a bicyclic azulene subunit, have intriguing properties that include the ability to form organometallic derivatives under mild conditions. In order to further investigate this unusual porphyrinoid system, the synthesis of methyl-substituted azuliporphyrin 1c and deazaazuliporphyrin 2 have been chosen as synthetic targets. 6-tert-Butyl- and 6-methylazulene, 3a and 3b, were reacted with two equivalents of an acetoxymethylpyrrole 4 in the presence of an acidic clay catalyst to give azulitripyrranes 5. Good yields were obtained for 5a but the methyl-substituted azulitripyrrane 5b was isolated in comparatively low yields. Although 5a reacts with pyrrole dialdehydes to give good yields of azuliporphyrins, this reaction failed for 5b, possibly due to the acidic nature of the methyl substituent. tert-Butylazulitripyrrane was also converted into the corresponding dialdehyde 6a by sequential treatment with trifluoroacetic acid and trimethyl orthoformate. Currently, the conversion of this species into a stretched dialdehyde 6b is under investigation. It is anticipated that McMurry condensation will convert 6b into deazaazuliporphyrin 2. This novel macrocycle will allow us to probe how the missing nitrogen atom affects the aromatic properties of these compounds.

STUDYING "NUCLEAR PASTA" IN NEUTRON STARS THROUGH 3-D PRINTING

Presenter	Jovanovich, Julian Undergraduate, Physics
Mentor	Prof. Matt Caplan

Nuclear pasta is a complex structure present in the inner layers of a neutron star. Large numbers of protons and neutrons rearrange themselves to find an equilibrium, forming shapes that resemble lasagna or spaghetti. This requires large scale computer simulations to study which makes visualization a challenge. We converted digital renderings of simulations into physical models using 3D printing. These physical representations of the pasta, with their different structures, are a resource to visualize these models for both scientists and the public.

CULTURAL DIFFERENCES OR POLITICAL DIFFERENCES? FLIPPING OVER THE HOFSTEDE'S 6-D MODEL OF CULTURE IN TERMS OF CONSERVATISM AND POLITICAL VIEWS

Presenter	Jung, Han Graduate, Psychology
Mentor	Prof. Eros DeSouza
Author	Han Jung

Hofstede's 6-D model of culture is one of the most widespread taxonomies regarding the cultural differences across the countries, but it has also faced many fierce antagonists. Most criticisms of the Hofstede model include identification of nations and cultures, superficial and narrow theoretical backgrounds, and suggestions of rival hypotheses. Especially, there is some evidence that suggests that the allegedly cultural differences may actually stem from political backgrounds or people's traits related to their political circumstances; Therefore, I expect that most of Hofstede's dimensions are associated with political traits of people and most national differences in Hofstede's dimensions will disappear if the influence of political traits are controlled. The political differences across nations may rather indicate the global commonality, not the differences dichotomously divided without consideration of the dynamic natures of culture.

ALTERATIONS IN FORCE TRANSFER MACHINERY DURING ACTIVITY-INDUCED HYPERTROPHY IN *C. ELEGANS*

Presenter	Killian, Emily Undergraduate, Biological Sciences
Mentor	Prof. Andres Vidal-Gadea
Authors	Kiley Hughes; Andres Vidal-Gadea

Muscles are unique because they produce the force needed for locomotion. The contractile machinery of muscle cells work together with the dystrophin glycoprotein complex (DGC) to transfer force out of the cell. Worms have three distinct locomotions that require different muscular outputs: swimming, burrowing, and crawling. Burrowing is a low frequency, high intensity activity and can cause activity induced muscle growth similarly to like exercises in humans. We are working to evaluate changes in DGC gene expression using qPCR and confocal microscopy. We hypothesize that the animals will modulate DGC gene expression along with muscular output to adapt to increase in force transfer.

Results show that the most calcium is produced when burrowing, and that burrowing has the highest amplitude movements. We know that burrowing causes hypertrophy based on the size of the worms as well as their muscle area and number after the physical activity. To see which dystrophin isoforms are expressed during hypertrophy, we will make transgenic animals by fluorescently labeling different long and short isoforms. We will then look at the ratio of fluorophores to see if expression patterns change. From there, we will quantify expression using qPCR. Evidence found in this study can be applied to our understanding of how the DGC adapts to the needs of an animal.

THE CRISIS AND CONTROVERSIALITY OF OVER FISHING THROUGH THE LENS OF ENVIRONMENTAL HUMAN SECURITY

Presenter

Kimbrow, Josh

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

The topic in this project is the global issue of overfishing. Overfishing is taking place all over the world and can pretty much be described by the name. There are thousands of commercial fishing companies that set up nets and other traps that require little to no effort when catching fish, and thus are taking way too many at a rate the fish are not able to reproduce. My research question is: What is the extent of overfishing in the Pacific Ocean? Is there an impact on human security due to threats to the ecosystem and fish reproductivity?

The real-world relevance that this topic has is that millions of people eat and rely on fish for their daily diet. It is a very healthy food option and would be detrimental if one or more species was lost due to lack of adequate management of our ocean's wildlife. The method I will use to configure my question will be through arts-based research. This will be helpful to visualize the extent of overfishing by drawing on images through news media sources.

GRACEFUL CHARACTERIZATIONS OF 6-VERTEX GRAPHS

Presenter

Kirk, Samuel

Undergraduate, Mathematics

Mentor

Prof. Songling Shan

Given a graph G with m edges, we can label the graph as graceful or not. A graph is graceful if there is a function $f: V(G) \rightarrow \{0, 1, 2, \dots, m\}$ so that distinct vertices receive distinct numbers and $\{|f(u) - f(v)| : u, v \in E(G)\} = \{1, 2, \dots, m\}$. In other words, we want to label the vertices such that no two vertices share a number, and that the edges are labeled with the absolute difference between their endpoints. The last stipulation is that all the edge must be distinctly labeled. In this project we characterize all 6-vertex graphs that are graceful, categorizing them and grouping them based upon their specific qualities.

HUMAN INSECURITY: VIOLENCE AND DRUGS IN CULIACAN, MEXICO

Presenter

Kolawole, Aminat
Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

What is the effect of Culiacan drug cartels on individual human security of Mexican citizens? This arts-based research project will focus on violence within the city of Culiacan, Mexico, in particular on the impact of drug cartels in this area. I will look at how cartels play a detrimental role that impacts families within the country, causing them to flee for their safety as well as the safety of their loved ones. I will look at steps that the governments of Mexico and the United States are taking to reduce this problem. The biggest drug cartel in Mexico at the moment is the Sinaloa cartel located in Culiacan. Recently, the son of a well-known drug lord, El-Chapo Guzman, was taken from police custody by the cartel after hours of gunfire. This is one of many ways the cartel has terrorized the streets of Mexico.

I will be using images from Getty images as well as credible news outlets that portray what is going on in Culiacan, Mexico.

ILLUSTRATING THE HIRSHFELD SURFACE THROUGH A NOVEL CRYSTAL STRUCTURE

Presenter	Kuzelka, Kaylee Undergraduate, Chemistry
Mentor	Prof. Gregory Ferrence
Authors	Kaylee Kuzelka; Shawn Hitchcock; Gregory Ferrence

A novel nitrite salt of n-cyclohexyl norephedrine was fortuitously discovered during the synthesis of (5S,6R)-4-cyclohexyl-5-methyl-6-phenyl-1,3,4-oxidiazinane-2-thione. This relatively simple structure provides a unique opportunity to explore the applications of the Hirshfeld surface analysis in light of various college-level chemistry classes such as general chemistry, organic chemistry, inorganic chemistry, and X-ray crystallography. This Hirshfeld surface was introduced by Mark A. Spackman and Patrick G. Byrom in a 1997 edition of Chemical Physical Letters as a means to divide "a crystalline electron distribution into molecular fragments." The electron distribution is obtained via X-ray crystallographic studies; an advanced chemical technique that relies on the regular packing of crystals and how the X-rays diffract through the spaces between individual atoms-effectively an atomic sized version of the diffraction gratings commonly described in physics classes. The packing of the crystal is described by one of thirty-two point groups, each of which represent unique combinations of various symmetry elements. Symmetry is a function of the physical shape of the molecule and can be extended to include various intermolecular interactions. The shape of the molecule itself can be broken down into various functional groups, each of which have typical attributes that can be visualized using the Hirshfeld surface analysis.

HEADPHONES ON, VOLUME UP: REGULATING SADNESS WITH SAD MUSIC

Presenter	Ladd, Kendall Graduate, Psychology
Mentor	Prof. Jeffrey Kahn
Author	Kendall Ladd

Occasionally we find ourselves wanting to immerse ourselves in sad music when we are experiencing sadness. Catharsis (expressing sadness), emotional support (knowing others experience the same sadness), understanding emotions (helps you understand your sadness), and mood congruency (matches your sadness) have been identified as the emotion regulation strategies we utilize when we choose to do so. This study sought to experimentally confirm the use of these four emotion regulation strategies that are used when we listen to sad music when in a sad emotional state. This was done by comparing these four to revival (reenergizing when tired), another strategy utilizing happy music (Saarikallio, 2008; Sedikides, 1992).

All participants (N = 122) were randomly assigned an emotion regulation strategy (i.e., catharsis, emotional support, understanding emotions, mood congruency, revival). After completing the PANAS-X Sadness subscale, they watched a film clip designed to induce sadness. Afterwards, participants completed the PANAS again and were told how to select a song to listen to using one of these emotion regulation strategies (e.g., catharsis: select a song that expresses your emotions). Participants listened to their song, completed the PANAS, and then a measure examining their song choice satisfaction. External raters rated the emotionality, arousal, and speed of the participant selected songs.

There was a significant main effect of time on participant sadness, $F(1.95, 228.40) = 127.44, p < .001$. Sadness significantly increased after the film clip and significantly decreased after listening to music, $ps < .001$. The time-by-condition interaction effect from after the film clip to after music listening was significant, $F(4, 117) = 3.02, p = .021$. Song satisfaction was not significantly different between conditions, $p = .955$. Songs selected by participants using revival had sadness and calming ratings that were significantly lower, and speed ratings that were significantly higher, than songs selected by participants in all other conditions (all $ps < .05$).

Despite the lack of significant differences in song satisfaction, participants in all conditions experienced significant decreases in sadness after music listening. Only the songs selected by participants using the catharsis, emotional support, understanding emotions, and mood congruency emotion regulation strategies selected songs that were rated as sad, calm, and slow. This suggests that these four strategies are used when we listen to sad music when feeling sad. Future research should examine these strategies in other sadness inducing situations, determine if they have differing levels of success, and if they are mutually exclusive.

LOST PLAYS AND THE ISSUE OF PRIMARY TEXT IN THEATRE

Presenter

Langellier, Samuel

Graduate, Theatre and Dance

Mentor

Prof. Bruce Burningham

Theatre has always been characterized as an ethereal artform. The spectation of any piece of theatre, done right, is incomparable to reading the script, yet often the script is all we have. Despite this, much of our knowledge and theoretical framework of Greek theatre has been gained through works such as Aristotle's Poetics and from a small number of spectator accounts. Countless plays have essentially become lost to time, a risk even advances to storage media can't eliminate to this day. While we know the names of many playwrights in antiquity, the number of surviving texts represents a fraction of what was originally produced. The few surviving works of playwrights such as Euripides and Sophocles that survived over 2000 years don't represent the full corpus of those authors' works, let alone the works of others. The structure of the City Dionysia, a festival and competition in Athens during which plays were produced, meant that each author produced four works and would receive a placement. Despite losing much of this, Aristotelian structures went on to have a large formative impact on much of western theatre. Hundreds of years later, European theatre would shape itself based upon Aristotelian values and unities and devalue anything working outside that frame. Fidelity, to this day, is valued despite gaps in theatrical literature. In this paper I will argue that the loss of primary theatrical texts represents a natural culling that impacts our understanding of theatre and the transmission of our own works.

RETROFITTING THE MCHENRY PUBLIC WORKS FACILITIES WITH LED LIGHTING AND SOLAR PHOTOVOLTAIC SYSTEMS

Presenter

Lechner, Jonathan

Undergraduate, Technology

Mentor

Prof. Jin Jo

With climate change being arguably the most pressing issue our planet is currently faced with, the need for sustainable and renewable energy is a priority. The objective of this research study is to retrofit the five McHenry Public Works Facilities with Light Emitting Diodes (LED) and solar photovoltaic (PV) systems in order to make the cities facilities more financially conservative and reduce their carbon dioxide emissions. Research tools such as Helioscope will be used to conduct shading analysis and geographic information systems (GIS) systems will be used to find the appropriate sizing for each case study area. System Advisory Model (SAM) will be used to conduct financial analysis of the photovoltaic (PV) systems. The outcome of this study will represent sites that are economically viable based upon the suggested sustainable energy retrofit. This research can be utilized as a reference case for future solar photovoltaic (PV) systems and Light Emitting Diode (LED) retrofitting projects.

WOMEN HELPING WOMEN: HOW CHICAGO'S JANE COLLECTIVE SAVED LIVES IN THE PRE-ROE V. WADE ERA

Presenter	Ledin, Laura Undergraduate, History
Mentor	Prof. Kyle Ciani

The passing of the *Roe v. Wade* ruling in 1973 opened up access to reproductive choice for women in the United States of America. Before this ruling, the restrictions on reproductive rights left women with very few options. Many women were then forced to expose themselves to the illegal and often dangerous procedures that operated outside of the law to retain their reproductive control that the government would not give them. The Jane Collective was born out of the need for safety, ignorance about abortion practices, and resistance from the men in Congress to understand reproductive freedom as a right. Operated out of Chicago, IL, the all-women Jane members provided safe abortion procedures to all women and ultimately saved their lives in the process. This thesis explores what kinds of illegal organizations and methods women used to gain control of their reproductive rights, and how women found these sources. Specifically, this thesis explores how women formed the Jane Collective and worked internally, how they operated and what problems they faced. Additionally, how Jane members provided resources and safety for women while remaining undetected by the law. These questions will be answered by analyzing primary sources such as audio-recorded interviews and personal accounts from Jane members, and their poetry and songs that they wrote for and about the Jane Collective. The results of this thesis will show how Jane contributed to the fight for women's reproductive rights, as well as how in the pre-Roe era Jane saved the lives of many women during a time of legal control of women's bodies. The Jane Collective is a prime example of why the fight for women's autonomy in society is so important and must continue to be fought for.

IMPACTS OF A CROSS-INSTITUTIONAL UNDERGRADUATE RESEARCH EXPERIENCE WORKSHOP ON STUDENT UNDERSTANDING OF AND SELF-EFFICACY FOR RESEARCH

Presenter	Liesman, Sara Graduate, Mathematics
Mentor	Prof. Olcay Akman
Authors	Angela Antonou; Sara Liesman; Megan Powell

There are many perceived benefits to undergraduate student research; however, students may not have a full understanding of the research process prior to engaging in a project. In this paper, we analyze the impact of an undergraduate research workshop on students' understanding of academic research as well as the impact on their self-efficacy for conducting research through an analysis of the 2018 and 2019 Intercollegiate Biomathematics Alliance Cross-Institutional Research Experience (CURE) workshops.

Students were asked to complete a survey at the start and end of the three-day workshop, which included both Likert-type scale questions as well as free response questions addressing their understanding of research and effective collaboration in conducting research, their perceived role in conducting research, and their perception of their own skills specific to biomathematics research. We observed improved self-efficacy in specific research skills where students had not already indicated a high level of self-efficacy prior to the workshop. Additionally, student responses indicated a shift in perception of research from solving a particular problem to contributing to a field by discovering or creating new knowledge. Other shifts in student perceptions are discussed in the paper as well as recommendations for the workshop organizers.

IS FAIR TRADE BRINGING SATISFYING IMPACTS TO THE UNITED STATES?

Presenter

Lin, Ann

Graduate, Family and Consumer Sciences

Mentor

Prof. Yoon Ma

With the increasing consciousness of ethical (Goworek, 2011) and various environmental issues (Mollenkropf, Stolze, Tate, & Ueltschy, 2010), people started paying more attention to the manufacturers who have produced products to satisfy basic human needs but haven't acquired enough benefits for the minimum level of their quality life including a promised wage, healthy working condition and the bonus they deserved to maintain the quality of their products. The purpose of this content-based research was to explore both possible positive and negative impacts of fair trade, the attitudes from the U.S. government and the retailer side, the viewpoints of manufacturers and workers, and the thoughts from consumers, comprehensively. The researcher reviewed scholarly articles and organization websites from the university library and Google Scholar by mainly using the keywords of fair trade, America, the consciousness of fair trade, and manufacturers in developing countries. The positive impacts of fair trade include that workers are able to gain a more favorable working environment, a promised fair wage, and additional compensations. In the environmental aspect, executing the Fairtrade Standard, which harmful chemicals and pesticides are not allowed, results in a better and sustainable environment (Fairtrade Foundation, n.d.). However, a stronger competition within small producers and different certified processes of the fair trade system became the concerns (Jaffee & Howard, 2016). For the U.S. government and the retail side, fair trade gives them opportunities to strengthen the relationships between workers and retailers (Cater, Beal, & Collins, 2016). The research studies demonstrated that consumers' willingness pays more to promote fair trade products and how consumers these days still lack consciousness of fair trade comparing to the population of fair trade supporters (Konuk, 2019). The biggest concern for the manufacturing companies which are executing fair trade is how to pursue the aspiration of fair trade but still achieve the expecting profits for their companies at the same time. By reviewing previous studies, this research provides a better understanding of fair trade nowadays and complications of it as well.

SOCIAL MEDIA'S INFLUENCE ON COLLEGIATE ATHLETES PROTEIN KNOWLEDGE

Presenter

Love, Kriston

Graduate, Family and Consumer Sciences

Mentor

Prof. Julie Schumacher

This research aims to examine how Instagram can be used as a means of education for collegiate athletes and their knowledge of protein. More specifically this research was aimed to compare the prior knowledge about protein that collegiate athletes have to the knowledge they may have retained after being exposed to posts on Instagram about protein. This study surveyed Division I collegiate athletes on their social media use and knowledge of protein before and after being exposed to protein related post on Instagram. The results of this study showed that there was no significant difference in participants knowledge of protein after being exposed to protein related posts on Instagram. Nutrition educators and sports nutrition coaches can utilize these results as they explore new options of educating athletes about nutritional needs.

SECURITY OF FREEDOM FOR THE PEOPLE OF HONG KONG

Presenter	Luu, Jacky Undergraduate, History
Mentor	Prof. Michaelene Cox
Co-Mentor	Prof. Nargiza Yusupova

This topic will explore how the Hong Kong people are trying to fight for their sovereignty from China. Hong Kong was a British colony for 100 years and was given back to China. Hong Kong was only a part of China for about 23 years. The Chinese Communist Party (CCP) and Hong Kong existed side by side for many years under two different governments. After Hong Kong's transition, the CCP refers to the arrangement as one country, two governments. But the CCP has a history of making its land homogenous which can be seen in areas such as Tibet and Xinjiang. My research question is: How can we assess the value Hong Kong people place on their independence and sovereignty from the CCP? Recent Hong Kong protests are one of the most recorded and photographed protests in modern media. This art-based research project will show the chronology and escalation of the unrest. The presentation will have visuals drawn from news media sources and/or image databases that cover the struggles of the Hong Kong people's fight against police and the CCP, which will give insight on how much the people are willing to struggle for their sovereignty.

ELUCIDATING THE MOLECULAR MECHANISM OF KINESIN-2 (KIF3A/KIF3B) AUTOINHIBITION

Presenter	Lyle, Christopher Undergraduate, Biological Sciences
Mentor	Prof. Martin F. Engelke
Authors	Christopher Lyle; Jessica M. Adams; Martin F. Engelke

Mammalian cells are dynamic, and their components are moved depending on the cells needs and functions. In order for the components of the cell to move in a dynamic fashion, motor proteins are used to facilitate this organization. There are different classes of motor proteins. This research will focus on a kinesin-2 family member, specifically the heterodimeric motor KIF3A/KIF3B. This motor protein is made of two subunits and walks along stretches of microtubules in the cell. When cellular components, also called cellular cargo, are moved or organized, they attach to the tail end of a motor protein located on the opposite end of the motor domain which attaches to the microtubules. When the motor protein is not needed, it autoinhibits, which ceases movement and thereby conserves energy. It is known that during autoinhibition, kinesin motors generally reside in a conformation in which the tail domain bind to, and thereby inhibit, the motor domains. Because kinesin-2 is a heterodimer motor, the tail-motor domain interactions that stabilize this conformation are not known and the focus of these experiments.

To determine the interactions that stabilize the autoinhibited conformation of KIF3A and KIF3B, we used a specially-engineered split-GFP molecule that will only fluoresce when the two halves are in contact with each other. We cloned constructs in which half of the split-GFP is placed on the tail end, while the other half is placed on the motor end for either the KIF3A or the KIF3B subunit. The split-GFP will only fluoresce if the two halves of the split-GFP come together. In this way, we can tell which part of KIF3A interacts with which part of KIF3B during autoinhibition. As a positive control, we also engineered similar constructs for KIF17, whose autoinhibition mechanism is already known.

We find that the transfection of both, the split-GFP-tagged KIF3A and the split-GFP-tagged KIF3B construct result in green fluorescence. This indicates that the KIF3A-tail, binds to the KIF3A-motor domain and the KIF3B-tail, binds to the KIF3B motor domain to mediate autoinhibition.

After experimentally confirming the interactions mediating the autoinhibited confirmation of KIF3A/ KIF3B, the next step is to map the specific amino acids that mediate these interactions. Additionally, we can also replace the split GFP with light-reactive domains, which likely result in kinesins whose activity can be extrinsically controlled with laser light.

PAID FAMILY LEAVE, BIRTH RATES AND EMPLOYMENT OUTCOMES FOR MOTHERS

Presenter	Madu, Kosiso
	Graduate, Economics
Mentor	Prof. Dimitrios Nikolaou
Author	Kosiso Madu

Reports on paid family leave policies assert that the policy increases women's economic opportunities and supports health of mothers and infants in Europe. Even in the United States, the only advanced country with no universal policy on paid family leave, discussions around the policy have managed to make the list of many campaign manifestos. As we approach yet another campaign season, we have candidates genuinely worried that it is high time we had a federal paid family leave policy and it is important that we consider all aspects of the policy to enable a more informed decision. This paper focuses on causal effects of the paid family leave on birth rates and employment outcomes for female workers within the child bearing age.

Family leave covers all paid leaves that eligible workers can take in order to give care to a sick family member, or bond with a new family member by birth, adoption, or foster placement. For mothers who welcome a new child, a universal implementation of the policy could lead to more women being employed and participating in the labor force. The fact that these women choose to work would imply an increase in the employment-to-population ratio. It could also encourage women to give birth to more children since they do not lose out entirely, in terms of income, while on leave. Papers have investigated various outcomes of the policies for the states where it is in operation and have estimated effects of the policy on health of mother and child, and labor outcomes of mothers. However, adequate evidence for its impact on birth rate and employment-to-population ratio of women is lacking and this paper intends to fill this gap.

It is against this backdrop that this paper investigates the effects of paid family leave policies on employment-to-population ratio, and birth rates of women in the United States. I take advantage of the fact that California, New Jersey, and Rhode Island are operating this policy at the state level and I focus on paid family leaves taken to bond with a new child.

EXPLORING THE IMPACT OF MENTAL ILLNESS IN THE NARRATIVE ACCOUNTS OF CRIMINALLY INVOLVED VETERANS

Presenter	Marcheschi, Tyler Graduate, Criminal Justice Sciences
Mentor	Prof. Phillip Mulvey
Authors	Phil Mulvey; Tyler Marcheschi

Life course theory suggests that military service can result both in positive and negative later life-course outcomes. While the military may provide individuals with employment and educational opportunities, it can also impact mental illness, physical injuries, violence, substance abuse issues, and criminal behavior. There is a significant amount of research showing increased prevalence rates of mental illness for Veterans, and specifically elevated rates of Post-traumatic stress disorder. As a result, the current study seeks to explore how mental illness among criminally involved veterans impacts their lives on a daily basis. To do so, the current project examines the narrative content of qualitative life-course interviews with 90 criminally involved Veterans in the Midwest (ranging from Vietnam to the wars of the post-9/11 era). The results of this project show that there is a significant number of veterans who have been diagnosed with a mental illness that are criminally involved. Mental illness among this sample has negative impacts on the lives of Veterans interviewed in various ways including criminal involvement, employment, social relationships, substance abuse, and violence.

PHYSICAL THERAPIST PERCEPTIONS OF ADHERENCE AND ITS EFFECT ON MOTIVATION

Presenter	Markovski, Teadora Graduate, Kinesiology & Recreation
Mentor	Prof. Scott Peirce
Authors	Teadora Markovski; Scott Pierce; Tony Amorose

Physical therapists (PT's) are professionally required to undertake a comprehensive examination of their patients and provide consultation within their expertise, yet also have the task to motivate patients to adhere to therapy. Self-determined motivation, as a positive predictor of treatment adherence, can be facilitated by promoting patient autonomy, competence and relatedness. However, a greater understanding is needed of the context specific strategies PT's can use to facilitate motivation. The purpose of this study is to explore physical therapists' (PT)s perceptions of the factors affecting patient motivation, strategies and methods to facilitate adherence, and strategies used to satisfy patients basic needs to facilitate intrinsic motivation. Physical therapists from around Illinois were contacted through purposive and convenience sampling to participate in semi-structured interviews pertaining to their perceptions of patient adherence and motivation throughout physical therapy. Using a critical realist philosophical perspective, the semi-structured interviews followed an interview guide focused on physical therapists' experiences with patient motivation and adherence. Participants included thirteen physical therapists (eight Female and five Male) with an average of 5.7 years experiences in the profession. After the completion of the interviews, a theoretical thematic analysis was conducted to identify themes related to self-determination theory, the basic needs theory and the importance of autonomy, competence, and relatedness to patient motivation. Preliminary findings show physical therapists perceive patient buy-in (autonomy), building rapport with patients (relatedness), and self-recognition of progress (competence) help patients become more adherent to physical therapy. Physical therapists believe they play a role in facilitating patient adherence and motivation, but the role is dependent on the patient's mindset, knowledge, and expectations of physical therapy. Findings will be presented to highlight the unique insights gained from the study along with practical recommendations for PT's practices and strategies to motivate patients.

EFFECT OF MOOD ON SHORT-TERM FALSE MEMORIES

Presenter	Martin, Amanda Undergraduate, Psychology
Mentor	Prof. Dawn McBride

Prior research has investigated the effects of positive vs. negative mood on producing false memories through the DRM paradigm, where studying related lists results in false memories for unstudied items related to the list themes. In the current experiment, we are investigating how mood, induced by classical music pieces, influences false memory at a short term delay, and if false memories are produced more from semantic- or phonologically-related lists. To examine this, participants will be randomly assigned to the positive or negative mood group. They will then study four-item lists of words related by meaning (semantic) or lexical (phonological) aspects of the words. A single test item will follow each list and will either be a list item (studied or unstudied) or a lure related to all the words in the list (measure of false memories). We hypothesize that the results will show that individuals in the positive mood group will produce higher levels of false recall as seen in prior research studies with long-term tests; however, we also hypothesize that individuals who study phonological lists of words will produce greater levels of false recognition rates compared to the semantic studied word lists, especially when in a positive mood. This would show that in short-term memory, sound errors are more likely, especially when not focused on the item-specific details (which mainly occurs when a negative mood is present).

YOU SAY YOU "CHOOSE HAPPY," BUT DO YOU REALLY?: ANALYZING THE USE AND PERCEPTION OF SHORT PERSONAL MANTRAS

Presenter

Mason, Emily (MJ)
Graduate, Communication

Mentor

Prof. John Baldwin

Short personal mantras (SPMs) have been present in religion, art, athletics and business throughout the course of history. However, outside of these designated categories, very little research has been done on the modern-day person's personal use of SPMs. This research explored the relationship between the motivation behind using and the reality of the perception of SPMs. Utilizing a qualitative approach, the researcher analyzed 70 responses to an open-ended questioner regarding SPMs. Specifically, the researcher explored what the intended purpose of identifying with a SPM is, what the perception of identifying with a SPM is and the perception of how the general public feels about identifying with a SPM. Results indicate that an individual's personal connection to an SPM is positively correlated with their perception of its use. Results also indicate that perception of the use of an SPM may strongly vary based off of where one attributes the phrase to be coming from. Limitations and future directions for research are discussed.

INVESTIGATIONS INTO THE SYNTHESIS OF PHENALIPORPHYRINS

Presenter	Mathius, Melissa
	Graduate, Chemistry
Mentor	Prof. Timothy Lash

Benziporphyrins **1** are nonaromatic porphyrinoids with a cross-conjugated 6π electron arene subunit. However, modification of this system can result in the formation of aromatic macrocycles. In this project, a benziporphyrin-like system **2** incorporating a phenalene subunit has been targeted for investigation. It is anticipated that this porphyrinoid will take on fully aromatic characteristics while retaining a fused naphthalene moiety. The required precursors to **2** are tripyrranes such as **3a** and **3b**, and tricyclic dialdehydes **4** or **5**. Initial attempts to prepare **4** by performing a Wittig condensation with perinaphthenone, followed by a Vilsmeier formylation, were unsuccessful. Currently, an alternative synthetic route to **5** is being developed beginning with 1-tetralone. Naphthylsuccinic anhydride **6** has been prepared and cyclized to produce keto acid **7a**. It is anticipated that esterification to produce **7b**, followed by a Wittig condensation and reduction with DIBAL-H, will afford the required dialdehyde **5**. Subsequent '3+1' condensation with tripyrranes **3** will afford phenaliporphyrins **2**.

UNMASKING DISPOSSESSION: GLOBAL JUSTICE IN THE TIME OF PHILANTHROCAPITALISM

Presenter

McCarthy, Michael
Graduate, Politics and Government

Mentor

Prof. Noha Shawki

This paper intervenes in the philosophical debate over moral agency in global justice through a critique of massive philanthropic organizations like the Bill and Melinda Gates Foundation. By problematizing the cosmopolitan ethic espoused by philanthrocapitalists and revealing the hidden ways philanthrocapitalists are contingent upon state action, this paper develops a more robust vision of philanthropy and global justice based in Lea Ypi's theory of statist cosmopolitan political agency and suggests possible methods for scholars and activists to pursue global justice.

DETERMINING THE RELATIONSHIP OF LANDSCAPE FACTORS AND PATHOGEN PREVALENCE IN WILD BUMBLE BEES

Presenter	McCormick, Elyse Graduate, Biological Sciences
Mentor	Prof. Benjamin Sadd
Authors	DJ McNeil; Elyse McCormick; Ashley Heimann; Margaret Weber; Sophie Tessier; Margarita López-Uribe; Christina Grozinger; Heather Hines

Some bumble bees (*Bombus* spp.) have been experiencing declines, which have been attributed to several different stressors. Pathogens such as Deformed Wing Virus (DWV), Black Queen Cell Virus (BQCV), and *Nosema bombi*, a microsporidian, can have detrimental effects on bumble bee health. In addition to pathogens, various landscape factors have been implicated in bee declines. However, few studies have looked at how multiple landscape factors and disease ecology are linked in wild bumble bees. We aimed to test the hypothesis that different landscape factors would influence prevalence of DWV, BQCV, and *Nosema bombi* in wild bumble bees. We also hypothesized that there would be differential immune gene expression in response to pathogen prevalence in each landscape. *Bombus impatiens* workers were collected across the state of Pennsylvania in the summers of 2018 and 2019. Collection sites varied in landscape composition, from agricultural areas to urban gardens. We performed RNA extraction, cDNA synthesis, and qPCR to determine quantities of viral RNA and *Nosema* DNA in our samples, as well as examine immune gene levels. We found consistency across years in BQCV patterns, which correlate high BQCV prevalence with spring floral resources, forest cover, and apiary density. Though in year one DWV trends showed higher prevalence in relation to floral resources and insecticide application, DWV did not correlate well with any landscape factors across both years. *Nosema bombi* showed no relationship to landscape factors. We did not see differential gene expression for either of the immune genes tested. These results suggest that any trends between landscape and prevalence are case-specific, indicating there are complex interactions occurring between hosts, pathogens, and landscape variables that will affect pollinator health.

EFFECT OF 7 WEEK TRAINING INTERVENTION ON ATHLETIC PERFORMANCE IMPROVEMENT

Presenter

McElroy, Maximilian
Graduate, Kinesiology & Recreation

Mentor

Prof. David Thomas

Many athletes seek out training programs to enhance athletic performance. The purpose of this research is to determine if the training intervention applied to the student-athletes show improvement of athletic performance. The program consisted of 25 high school student athletes who trained 3 days a week for 7 weeks. The procedure for the program was implemented at a hospital for sports enhancement and followed the Athletic Republic training regimen. A pre and posttest was obtained, and the tests were included for a total of 21 sessions. The pre and posttest applied to the student athletes consisted of gathering height, weight, vertical jump no gather, vertical jump 1 gather step, standing long jump, 20-yard dash, and a pro agility test. The program started with the pretest, then the athletes trained on Mondays, Wednesdays, and Fridays for one hour. Mondays and Fridays consisted of a series of sprints on the Athletic Republic treadmill with different speeds and inclines, and Wednesdays consisted of a series of plyometric jumps using body weight, belt resistance bands, and 4-inch hurdles. The 21st session consisted of the posttest. The results show that most athletes had improved in jumps, speed/acceleration, or in both. The data gathered during this program shows that improvement of vertical jump and acceleration is possible and that the small gains made may result in looking for another speed and power program.

MOBILE TECHNOLOGY AND EDUCATIONAL ENGAGEMENT

Presenter	McGinity, Sean Graduate, Psychology
Mentor	Prof. Julie Campbell
Authors	Sean McGinity; Julie Campbell

This study will examine the differences in classroom behavior and perceptions of lectures using an interactive educational mobile application and more traditional PowerPoint slides in two sections of an adolescent development class. Classroom behavior was measured in terms of the number of questions asked during a given lecture, the depth of knowledge that those questions suggested and whether students were more or less engaged. Our hypothesis is that the section with the mobile app will show more on-task behavior and greater depth of knowledge in terms of their questions given the accessibility to the slides the app provides as well as keeping them from using their phones for non-class related activities (texting, social media, etc.). Perceptions of the educational mobile app and the PowerPoint were measured through surveys and questionnaires which also extensively examined how technology literate students in both sections were with multi-format questions about what kinds of technology students had experience with and how long they had been using them. These will be examined to determine if more technology literate students had better perceptions of the educational app.

UNIVERSAL SCALING LAWS FOR OPTIMALLY EXCITED NONLINEAR OSCILLATORS

Presenter	McGinnis, Cassie Undergraduate, Physics
Mentors	Prof. D.L. Holland, Q. Charles Su, Rainer Grobe
Authors	Cassie N. McGinnis; D.L. Holland; Q. Charles Su; Rainer Grobe

We compute the optimal temporal profile for an external driving force $F(t)$ that can maximize the energy absorption of any driven non-linear oscillator [1]. The technique is based on constraining the maximum amplitude of the force field such that optimal control theory can provide quasi-analytical solutions. We illustrate this computational technique for the undamped Duffing oscillator as well as for a driven quantum mechanical two-level system. We find that under optimal force conditions the asymptotic time-dependence of the maximum amplitude growth is given by a universal power law. As a universal result, this predicts that the maximal energy absorption of any non-linear oscillator grows (under an optimized force field) quadratically in time. We also find for the two-level system that -even under optimized excitation conditions- the maximally achievable inversion does not monotonically increase with the force amplitude but it is characterized by an interesting sequence of thresholds. This work has been supported by the NSF and Research Corporation.

[1] C.N. McGinnis, D.L. Holland, Q. Su and R. Grobe, Phys. Rev. E 101, 032202 (2020).

MICROPLASTICS IN AGRICULTURAL TILE DRAINAGE AND SURFACE WATERS DURING PERIODS OF HIGH AND LOW FLOW

Presenter	McGinnis, Laurel Graduate, Biological Sciences
Mentor	Prof. Bill Perry
Authors	Laurel McGinnis; Bill Perry

Microplastic accumulation is one of the greatest changes to every ecosystem on Earth. Microplastics, < 5 mm in diameter, are an emerging contaminant of concern and are found across every habitat. Microplastics are directly released into the environment from industrial and personal care products or are a result of degradation and fragmentation of larger plastic debris. Microplastic contamination in the natural environment can have negative chemical and ecological effects on aquatic biota and humans. Rivers are an important transport pathway of microplastics from terrestrial to marine ecosystems. There is very little data on the abundance of microplastics in freshwater. To better understand the magnitude of microplastic contamination in freshwater, I measured the concentration of microplastic in agricultural drainage tiles and surface waters in McLean County, Illinois during low flow periods. I collected grab samples for four tile and four stream sites across three watersheds. I performed a wet peroxide oxidation to digest all the organic material out of the sample and then performed a density separation to get all the plastic to float to the top of my separatory funnel. From here, I filtered the remaining liquid and was able to count the microplastic particles under a dissecting scope. I found on average tile water contained 40% microplastic particles per liter than surface water. These streams lead into drinking water reservoirs in Bloomington. Quantifying the extent of microplastic pollution in freshwater systems would give insight to areas at risk to public health and in need of management or mitigation. The results of this study will allow us to compare microplastic pollution in streams to the extensive literature on microplastic in marine systems.

CLIMATE CHANGE: A DANGEROUS THREAT TO HUMAN SECURITY

Presenter

McKnight, Romeo

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

Will environmental human security at the local level be progressively threatened as the climate changes? As one of the most pressing issues of our time, climate change threatens the lives and livelihood of billions of people. Many aspects of climate change pose a threat. Some of the most significant and destroying threats we see in struggling countries. Infectious diseases are highly alarming. Malaria, is of greatest public health concern, and seems likely to be the vector-borne disease most sensitive to long-term climate change. Underdeveloped countries such as Africa are severely affected by these changes. This project will use photos from news media sources or image databases to respond to the research question.

A VISUALIZATION OF MILITARY SECURITY IN CENTRAL ILLINOIS

Presenter	Mendoza, German Undergraduate, Politics and Government
Mentor	Prof. Michaelene Cox
Author	German Mendoza

What threats to human security do domestic military forces face in central Illinois? This exploratory analysis of images captured by the author, as well as derived from editorial/news sources points to multiple dimensions of human insecurity and illustrates the nature and degree of challenges faced by individuals or groups at the state level. Studies in human security are generally regarded as interdisciplinary frameworks centered on examining the welfare of people, rather than on conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There have been few studies that employ an arts-based research methodology to examine possible root causes, actors, and remedial initiatives dealing with human security concerns in specific cases at the local levels within developed countries. In summation, this project includes captioned photographs and accompanying narratives to present viewers with a unique perspective of a contemporary phenomenon, while underscoring the subjective nature in determining who defines security, what it constitutes and who is at risk when facing the true possibility of a conflict within a state.

"MENTAL HEALTH SERVICE PREFERENCES AMONG ILLINOIS DAIRY FARMERS: A BEST-WORST SCALING APPROACH"

Presenter

Messman, Brianna
Graduate, Agriculture

Mentor

Prof. Michael Barrowclough

Mental health has gained significant awareness across the United States (U.S.) in the past decade. Some communities in the U.S. however, have only recently begun to address this topic. Importance of mental health is expanding within the agriculture community. One reason for this could be low levels of mental health within this community. For instance, males in the U.S. agriculture sector had a suicide rate of over one and half times the national average in 2015. Mental health concerns have been increasing in a particular sector in agriculture more recently, the dairy industry. Some of the main reasons for decreasing mental health in the dairy sector include low milk prices, excess supply, economic hardships, and retaliatory tariffs imposed by Mexico and Canada. (Baker, 2019). With the ongoing trend of negative economic returns for dairy farmers projected to continue through 2020, there is no better time to address mental health concerns for dairy farmers.

This study will focus specifically on dairy producers in the Midwest state of Illinois. 2018 brought about the lowest net returns per cow since 2012 at a negative \$747 (Zwilling, 2019). Combining negative returns with increasing feed costs and continued low milk prices and the importance of this topic is realized (Zwilling, 2019). The five objectives that this study is focused on are: identifying mental health service options preferred by Illinois dairy farmers willing to seek help, quantifying tradeoffs that Illinois dairy producers are willing to make when choosing between service options, determine factors that affect the tradeoff decisions that will be made, examine anxiety and depression levels and that impact that has on decision making, and identifying subgroups, if any, that may influence any tradeoff decisions that will be made. A questionnaire will be administered using the best-worst scaling approach to collect qualitative data in regards to the mental health of dairy farmers in order to achieve this goal. This data will be examined in order to acquire a greater understanding of this topic such as service preferences, possible mental health disorders, and various demographics.

The findings from this study have the potential to assist policy makers in creating and implementing programs that will benefit the mental health of agricultural producers.

SIMULATING THE ORBITAL PRECESSION OF COMETS

Presenter	Miles, John
	Undergraduate, Physics
Mentor	Prof. Matt Caplan
Author	John Miles

We use Newton's law of universal gravitation in an n-body Fortran code to simulate the orbital procession of comets in 3 dimensions. In a two-body Keplerian orbit, planets orbit the sun on fixed orbits meaning they are bound and always repeat. In contrast, a three-body system does not necessarily repeat; forces between planets allow them to transfer angular momentum and energy. Therefore, orbits fluctuate. With small bodies, like comets, the changes are drastic. We simulate the solar system including minor bodies like comets and we observe the evolution of their orbits. We quantify the evolution of the orbit using the time-varying eccentricity and angular momentum, and the phase angle at aphelion. In addition, we simulate three-body sun-planet-comet systems to resolve each planet's contribution to the comet's orbital evolution. From this we isolate the role of each planet on minor body orbital perturbations.

TRANSMEDIA STORYTELLING: A SHIFT FROM SCROLL FRAMES TO PICTUREBOOKS

Presenter	Mondal, Sayanti
	Graduate, English
Mentor	Prof. Paul Ugor
Author	Sayanti Mondal

In the era of globalization, a recent spurt of demand has been noticed across the global art market regarding folk art forms. This poster contributes to the scholarship on the politics of production and consumption of folk arts in modern India, as well as discusses how globalization has impacted the aesthetics of such artforms. Additionally, the poster also highlights how the initial purpose of entertainment through folk art has gained an alternative 'oriental' connotation with the onset of commercialization. Rather than restricting itself to the local market forces, the artform has extended its boundaries to satisfy a global economy, with the ulterior risk of being exoticized within the international market. The poster specifically analyzes patachitra (traditional scroll-painting in India) as a form of folk art that has lost its traditional value and has taken recourse to alternative forms of storytelling, specifically through picturebooks, to compete with the market forces. Through a close reading of the illustrations from Samhita Arni's picturebook (illustrated by Moyna Chitrakar) *Sita's Ramayana* (2011), I demonstrate how the traditional scroll-painting has adapted itself to the modern genre of picturebooks, thereby losing its much-coveted performative tradition. The poster illustrates not only how the change in genre has affected the audience, but also has impacted the artist's work, especially due to the added layers of intervention and negotiations the artist now confronts from various quarters of the globalized market.

SUBLUMINAL SIGNAL DEGRADATION DURING FREE FALL ACROSS THE EVENT HORIZON OF A BLACK HOLE

Presenter	Moore, Annie Undergraduate, Physics
Mentors	Prof. Matt Caplan, Neil Christensen
Authors	Annie Moore; Neil Christensen; Matt Caplan

It is often stated that a free-falling observer would not notice the crossing of the event horizon when falling towards a very massive black hole since the tidal forces are so small. However, although this is true, we preliminarily show that a signal sent between two observers during free fall is significantly degraded and would be noticeable by the time the event horizon is encountered. In particular, we consider two observers which start at rest and fall into the black hole. As they do this, they send a signal between themselves at subluminal speeds and measure the proper time between sending and receiving those signals. We analyze this situation with a variety of different initial observer separations, starting positions, and signal speeds. Our preliminary results show that the time delay grows, and becomes significantly larger, and noticeable, as the event horizon is crossed, even if the tidal forces are insignificant.

MORAL LUCK

Presenter

Morenz, Brooke

Undergraduate, Philosophy

Mentor

Prof. Daniel Breyer

Authors

Brooke Morenz; Daniel Breyer

Much research has been done on the concept of Moral Responsibility, but not much on the concept of Moral Luck. Moral Luck "describes circumstances whereby a moral agent is assigned moral blame or praise for an action or its consequences even if it is clear that said agent did not have full control over either the action or its consequences." This study aims to examine what contributions the concept Moral Luck makes to our human perceptions of other people's and our own level of moral responsibility.

BEWITCHING THE BLAME: THE CRUCIBLE'S LEGACY OF SEXUAL SHAME AND CULTURAL OTHERING IN POPULAR CULTURE

Presenter	Morris, Hope
	Graduate, Theatre and Dance
Mentor	Prof. Kee-Yoon Nahm
Co-Mentor	Prof. Ann Haugo
Author	Hope Morris

Arthur Miller's rewriting of the history of the Salem witch trials through his play *The Crucible* has had a profound impact on the way the trials are presented on stage and screen. Miller uses the sexual prowess of Abigail and the voodoo witch craft of Tituba to explain the cause of the trials. This misogynistic and xenophobic blame of female sexuality and black magic has carried into contemporary representations of the trials including film versions of *The Crucible*, television shows *Salem* and *American Horror Story*, and recent play, *Abigail/1702*. However, other playwrights are striving to realign their works to the truth of Salem, including Sarah Ruhl with her play, *Becky Nurse of Salem* and Carol S. Lashof with *Witch Hunt*.

This presentation centers on my research surrounding the changes to history made by Arthur Miller and how that changes modern perspectives of the Salem witch trials.

THERMOELECTRIC MICROSCOPE THEORY

Presenter

Mueller, Daniel
Undergraduate, Physics

Mentor

Prof. Justin Bergfield

Scanning tunneling microscopes (STMs) image the nanoworld by measuring the current flowing through a sample. In response to an applied temperature difference, current flows until a voltage is built up to oppose the flow. The ratio of the voltage to the temperature difference is a measurable quantity known as the thermopower. Although thermoelectric devices are important for a variety of heating and cooling applications, we propose that the thermopower is also of interest as a microscopic observable because it is a probe of the second moment of the transport. In this work, we derive the theory necessary to describe this new microscopic technique. We also simulate several images produced by a scanning thermopower probe (SThM) and discuss the implications of the technique.

COCKATOO: AUDIO BASED TRUE RANDOM NUMBER GENERATOR

Presenter

Munoz, Jake
Undergraduate, Physics

Mentors

Prof. Rosangela Follmann; Epaminondas Rosa Jr

Random numbers are a fundamental piece in generating cryptographically secure keys to securely transfer data over a network. With the rise of Internet of Things (IOT) devices, many security researchers have been raising questions about how to ensure the security of these devices. One of the biggest issues is the inability for the central processing units (CPUs) on these devices to generate pseudo random or true random numbers with high levels of entropy. A true source of randomness is nature, as for example, thermal fluctuations and atmospheric noise. In general, computers use the movement of the mouse as a source of randomness, but this is not available for IOT devices. However, many IOT devices have microphones built into them which can be used to generate true random numbers. In this research project we developed an algorithm to generate cryptographic keys using audio. Different levels of sound intensity are tested, and entropy is computed for each case. The aim of this project is to determine whether or not generating cryptographic keys is possible by parsing audio data with a high entropy value.

HOW STRESSFUL WILL COUNSELING BE? APPRAISALS OF CONTROL AND CHALLENGE PREDICT HELP-SEEKING INTENTIONS

Presenter	Namboodiri, Rachael Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Authors	Rachael Namboodiri; Daniel Lannin; Patrick Heath

A. Purpose

Mental health counseling is an effective treatment for mental health concerns (APA, 2012), though psychological barriers prevent people from seeking out counseling when distressed (Corrigan, 2004). Self-stigma, or an individual's fear that seeking help would lead to diminished self-worth, is one commonly cited psychological barrier leading to lower help-seeking intent (Lannin et. al. 2015). One untested barrier is whether individuals believe they would be able to cope with potential stress created by attending and participating in counseling (cf. stress appraisal theory; Peacock & Wong, 1990). Therefore, this study attempts to address this gap in the literature by testing whether stress appraisals predict help-seeking intentions above and beyond the previously identified barrier of self-stigma.

B. Methods

Participants (N = 215; Age, M = 19.58, SD = 1.85; Ethnicity, White = 71.3%, African American/Black = 10.2%, Multiracial = 7.9%, Hispanic/Latinx = 6.9%, Asian/Asian American = 3.7%; Sex, Female = 72.2%, Male = 27.3%) completed in-person assessments of previous counseling experience, distress (Kessler et al., 2002), self-stigma of seeking psychological help (Vogel et al., 2006), and an adapted stress appraisal measure (SAM; Peacock & Wong, 1990) that assessed how stressful the prospect of utilizing counseling would be via 5 four-item appraisal subscales (perceptions of self-controllability, centrality, threat, stress, and challenge).

C. Results

A multiple regression predicting intentions to seek counseling was conducted with previous counseling experience entered in step one, self-stigma entered in step two, and the five subscales of the stress appraisal measure entered in step three. Whereas distress and previous counseling accounted for 16% of the variance in intent to seek counseling, including self-stigma in step two significantly increased the amount of variance explained by 18% ($R^2 = 0.34$, $p < .001$), and including counseling stress-appraisals in step three significantly increased the amount of variance explained by 21% ($R^2 = 0.55$, $p < .001$), with stress-appraisals of challenge ($\beta = .30$, $p < .001$) and self-control ($\beta = .21$, $p = .004$) being significant predictors.

D. Conclusions

While beliefs about stigma are salient in the help-seeking process, the present study suggests that regarding counseling as a manageable challenge rather than a stressor is a predictor of help-seeking intentions as well. Additionally, believing that one appraises counseling as an environment where they can be successful may bolster help-seeking intentions, suggesting that this could be an important area to focus on in outreach programming in the future.

IMPACT OF LIQUID BREWERS YEAST FEED ADDITIVE ON LATE GESTATION EWE PERFORMANCE

Presenter	Navarrete, Julissa
	Graduate, Agriculture
Mentor	Prof. Jennifer Earing
Authors	Julissa Navarrete; Jennifer Earing

One of the by-products of the brewery industry is liquid brewers yeast. While many large commercial breweries have the budget for forwarding this by-product to a secondary industry, for local microbreweries, the cost associated with further processing makes this option difficult.

While research has investigated the use of liquid brewers yeast in cattle diets, there is currently limited research feeding liquid brewers yeast to small ruminants. Therefore, this study seeks to determine the impact of adding liquid brewers yeast to late gestation ewe diets on ewe performance immediately prior to and after parturition.

Thirty-one ewes will be synchronized and bred using the live cover method. Ewes will be stratified by weight into 2 feeding groups: one fed a traditional diet (CON), and the other fed the traditional diet supplemented with liquid brewers yeast (at a rate of 32 g of dry matter per head per day; LBY). Water and grass hay will be offered ad libitum to both groups. The trial period will span 60-days; 30 days prior to parturition through 30 days post-parturition. Each of the following measures will be used to assess ewe performance: ewe average daily gain, ewe feed efficiency, ewe body condition score, number of lambs born, number of lambs alive, lambing ease, lamb birth weight, and lamb average daily gain. Additionally, colostrum and milk samples (at 2- and 4-weeks post-parturition) will be collected and analyzed for nutrient composition to assess milk quality.

The expectation of this study is to show increased performance in ewes supplemented with LBY. The information collected from this study will provide producers knowledge regarding the potential value of locally produced liquid brewers yeast for their livestock. It will also give microbreweries useful information regarding how to market their by-products locally.

MICROPLASTIC CONCENTRATIONS AND TYPES IN SUGAR CREEK AND ITS TRIBUTARIES IN BLOOMINGTON AND NORMAL, ILLINOIS

Presenter

Noseworthy, Caitlin

Graduate, Geography, Geology, and the Environment

Mentor

Prof. Catherine O'Reilly

Microplastics have become an increasingly pervasive problem in many aquatic ecosystems. To date, most microplastic research has focused on marine systems as well as larger lakes and rivers. Studies conducted in the Chicago, Seine, and Danube Rivers respectively found the mean microplastic concentrations to be: 1.94 MP per m³, 30 MP per m³, and 0.32 MP per m³. This study will investigate the microplastic concentrations and types in a small urban stream and its tributaries. The watershed characteristics will also be noted in order to determine the relationship between watershed land use and microplastic content. Grab samples will be collected from Sugar Creek and respective tributaries over the summer. The samples will go through a separation process to isolate the microplastics for visual analysis. A subset of samples will be sent to the Illinois Sustainable Technology Center for identification of the plastic polymers. Preliminary data shows that microplastic concentrations in urban streams may be orders of magnitude greater than those found in larger rivers. Four samples were taken, and visual analysis found the average concentration to be 7,000 MP per m³. Land use is expected to influence the types and concentrations of microplastics. This study aims to understand microplastic concentrations and types in an urban stream, determine what factors influence microplastic concentrations, and identify microplastic polymer compositions to determine potential sources.

OXADIAZINONES AS CHIRAL AUXILIARIES: ASYMMETRIC CONJUGATE ADDITION REACTIONS WITH EPHEDRA BASED OXADIAZINONES

Presenter	Obe, Fatima
	Graduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authors	Fatima Obe; Shawn Hitchcock

The stereoselective formation of carbon-carbon bonds through the process of conjugate addition has proven to be a very important methodology in synthetic organic chemistry. We became interested in exploring the potential utility of oxadiazinones in asymmetric conjugate addition applications. In this context, oxadiazinones (1) are chiral auxiliaries that have been applied in the asymmetric aldol addition reaction. Our current efforts are directed towards employing these compounds as chiral scaffolds for the process of asymmetric conjugate addition with the ultimate objective of using this methodology in the preparation of gamma-amino acids such as Tolterodine. Our preliminary efforts focused on using an N4-p-methoxyphenyl substituted oxadiazinone. This oxadiazinone was acylated with trans-cinnamic acid via the Steglich reaction with 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC) and catalytic N, N'-dimethylamino pyridine (DMAP). This substrate was then reacted with a Normant reagent, a mixture of the Grignard reagent, methylmagnesium bromide and copper (I) bromide-dimethylsulfide complex. The reaction was carried out in diethyl ether and in tetrahydrofuran. While tetrahydrofuran gave the superior result, still the diastereoselectivity of the conjugate addition was determined by 500 MHz NMR spectroscopy to be no greater than 3:1, a value unsuitable for meaningful asymmetric synthesis. This observation was in contrast to higher stereoselectivities observed in the asymmetric aldol reaction with Ephedra based oxadiazinones where ratios of 95:5 are commonly observed. It was reasoned that the electrophilic site of the conjugate addition was further away from the stereodirecting group at the N4-position than the aldol reactive site. To resolve this issue, a new series of oxadiazinones were prepared, namely N4-2-naphthylmethyloxadiazinone and N4-p-methoxybenzyloxadiazinone and used in the asymmetric conjugate addition process. This poster will describe the chemistry that has been accomplished to this point and make projections for future efforts in the synthesis of the medicinally valuable target compound, tolterodine.

TWEETING ABOUT WORK: CONTENT AND SENTIMENT OF EMPLOYEES' TWEETS

Presenter	Onuegbu, Nija Undergraduate, Psychology
Mentor	Prof. Kimberly Schneider
Authors	Nija Onuegbu; Kimberly Schneider

Employees increasingly use social media and other communication technologies both inside and outside the workplace (Walden, 2016). Social media use has the potential to help increase organizational communication, both externally with customers and internally with employees. Although there may be a positive impact of social media within workplaces (Vaast & Kaganer, 2013), there is not yet a clear picture of how employees use social media platforms and potential links to discussions of their work. In the current study, we reference Zoonen et al.'s (2015) typology of content of work-related social media posts to determine for our sample what were the most common types of work-related tweets. This typology included general commentary, work behavior, work resources, compensation, work-life balance, stressors, staffing, scheduling, external factors, and job comparisons. We also examined differences between the day of the week that employees tweeted and their tone/sentiment. We hypothesized that tweets would be more positive during the weekend than during weekdays and that the average tone(sentiment) would be negative.

Methods We used the Meltwater Outside Insight social media analytics application (Meltwater, 2018) to gather work-related tweets from a 7-day period in March of 2018. To allow for a manageable sample that we could code, we focused on our campus setting and expanded to a 200-mile radius to collect tweets during the 7-day period. Without such a location filter, we would have captured hundreds of thousands of tweets. Using filters to access only English-language tweets that we could subsequently code and searching for any work-related keywords from a list we generated (i.e., 'work', 'job', 'boss', 'coworker', 'employee'), we collected 2,271 tweets within the 7-day period. Next, we cleaned the data to remove duplicate tweets and retweets which reduced the original data to a smaller sample of 1,192 tweets. We next removed irrelevant tweets (e.g., political content) and were left with 868 tweets.

Initial Results Initial results focused on the content of work-related tweets have shown that most contained content pertaining to work-life balance, external influences, and general statements about their job. Sentiment analyses of tweets indicated the overall tone of the tweets was positive, contrary to the hypothesis. The results of our study indicate that Twitter can be used to gain insight into the positive aspects of employees' job perceptions. We anticipate the continuing emergence of social media platforms as outlets for employees to express emotions and reactions to their jobs.

SELF-SEGREGATION INTO STEREOTYPICAL STUDENT IDENTITIES IN HIGH SCHOOL SETTINGS

Presenter

Paris, Melissa

Undergraduate, Family and Consumer Sciences

Mentor

Prof. Elke Altenburger

Educators, parents, and students can all concur that the absence of bullying would create a healthier academic environment at secondary schools. Students yearn for the freedom to choose with whom they sit at school in and out of the classroom. But this choice can lead to regret. Teenage peers tend to group themselves based on superficial attributes such as current beauty standards for females or physical prowess for males. Is it possible that students are unconsciously conforming to typical adolescent stereotypes?

A certain pressure comes with these stereotypes. The goal of my research is to better understand how teens are unknowingly pressuring themselves to conform to conventions and how it affects their social life in high school. A data set from a multiple case study of rural high schools conducted by Dr. Elke Altenburger, suggests strong patterns to these high school students' ways to place themselves within cliques. Field note and interview data have so far both shown that even participants who engaged in unsolicited claims to be inclusive, self-segregate into groups of similar-minded peers.

Stereotypes like these threaten the normalcy of a teenager's behavior, actions, self-esteem, and social adaptation. Self-social grouping is a contributing factor to bullying, and awareness is the first step to a solution. With this data, I provide the beginning of a clearer understanding of stereotypes such as a unique view of a jock's perspective. I also discuss possible ways to further this research.

AN ELECTRON SPIN DISTRIBUTION COMPARISON BETWEEN N-METHYL BENZOTRIAZOLE AND N-METHYL TRIAZOLE ANION RADICAL

Presenter	Patel, Krutil Undergraduate, Chemistry
Mentor	Prof. Steven Peters
Authors	Krutil Patel; Steven Peters; Daniel Beres

Substituted 1,2,3-triazoles and Benzotriazoles come in an assortment of derivatives. In the case of the latter, the structure is a benzene ring fused to a triazole ring. There are various applications for these molecular systems, such as their role in the pharmacology field as an antiviral, antifungal or an analgesic to the industry field as an anti-tarnish agent for copper, corrosion inhibitor or in antifreeze. Interestingly, the anion radicals of these two heterocycles have not been explored until now. Alkali metal reductions of the N1- and N2-methylbenzotriazole as well as the smaller N1- and N2-methyl triazole have been performed under vacuum conditions, and the electron spin distribution in these anion radicals has been analyzed via Electron Paramagnetic Resonance (EPR) spectroscopic techniques. The EPR results obtained will be presented as well as the differences in the electron spin distribution within the isomers of each species. These studies open the door for the possibility of exploring the reduction of a host of unique triazole systems.

TRANSITION BETWEEN COHERENT AND INCOHERENT CHIRPING MECHANISMS IN ELECTRON-POSITRON PAIR CREATION

Presenter	Penwell, Austin Undergraduate, Physics
Mentors	Prof. Q. Charles Su, Rainer Grobe
Authors	Austin Penwell; C. Gong; Q. Charles Su; Rainer Grobe

We examine the effect of a frequency-chirped external force field on the final energy that has been absorbed by two classical mechanical oscillators, by quantum mechanical two- and three-level systems and by electron-positron pairs that were created from the quantum field theoretical Dirac vacuum [1]. By comparing the final dynamical responses to the original force field with that associated with the corresponding time-reversed field, we can test the sensitivity of each of these five systems to the temporal phase information contained in the field. We predict that the linear oscillator, the two-level atom and the pair creation process triggered by a spatially homogeneous field are remarkably immune to this phase, whereas the quartic oscillator, the three-level atom or the pair creation process caused by a space-time field absorb the provided energy differently depending on the temporal details of the external field. This work has been supported by the NSF, Research Corporation, and the China Scholarship Council program.

[1] C. Gong, A. Penwell, Z.L. Li, Y.J. Li, Q. Su and R. Grobe, J. Opt. Soc. Am. B (in press)

SENSITIVITY TO CLIMATE AND HUMAN IMPACTS, THE SUDD WETLAND

Presenter

Persico, Geno

Graduate, Geography, Geology, and the Environment

Mentor

Prof. Wondy Seyoum

Today's existential crisis of climate change not only affects temperature, changing of sea levels, and ice present, but it impacts the hydrologic cycle. The hydrologic cycle is a consistent rotating belt of water to different parts of the system through various processes in and around the globe. Anthropogenic methods such as irrigation for economic and agricultural needs, contamination of water systems, and urbanization put large amounts of stress on the hydrologic cycle; due to increased populations, expanding urbanization, deforestation, and industrialization. Altering the two main climate constituents, precipitation and temperature, will upset the balance of regions around the world that could lead to serious impacts on natural and human systems. Certain regions that need to be monitored may be inaccessible to scientists and their equipment.

The study area, Sudd Wetlands South Sudan, East Africa, that is focused on in this project is in the Nile River drainage basin, which extends from the northern borders of Tanzania to the mouth of the Nile River in Egypt where it flows into the Mediterranean Sea. The Sudd is the largest wetland system in Africa and one of the largest tropical wetlands in the world. With it being the largest wetland, the diversity of flora and fauna are prevalent to the dynamics of the wetland and region. Due to the geography, inaccessibility, and continuous conflicts unsettling the region, the wetland has not seen many in-situ studies performed. The rapid development of technology and scientific innovations have allowed for scientists to have the ability to observe from afar. Using satellites, climate data has been compiled over the decades to develop trends. Remote sensing and modeling allow for researches to be conducted on regions in the world that are hard to access because of terrain or human conflicts, which will be the focus of this project. Due to seasonal and long-term variability of the climate and increase in human development in the region, the wetland is speculated to reduce in size from the stress put on it.

AN EXAMINATION OF THE METHODOLOGICAL APPROACH OF ECOLOGICAL MOMENTARY DATA ASSESSMENT IN THE FIELD OF CRIMINAL JUSTICE

Presenter	Peuterbaugh, Meghan Graduate, Criminal Justice Sciences
Mentor	Prof. Phillip Mulvey
Authors	Meghan Peuterbaugh; Phillip Mulvey

Ecological Momentary Data Assessment (EMDA) is a term used for the methodological approach of measuring episodic representations of participants' everyday life, or their experience as it occurs. First coined as the Experience Sampling Method by Csikszentmihalyi & Larson in their study on adolescents in a Midwestern suburb in 1984, EMDA methodology has evolved across a plethora of disciplines to measure thoughts, feelings, and actions of various populations. By measuring experience over time, EMDA consists of examining moment to moment emotional and behavioral change that is rich with participant detail while also minimizing recall bias and increasing ecological validity. Despite these benefits, and its popularity within social science, EMDA has rarely been employed in the field of criminology and criminal justice. As a result, this project seeks to inform researchers on the history of EMDA in social science, where it can be utilized in criminal justice research, and several of the nuances in using the methodology. A National Institute of Justice research study involving the life-course of Veterans in the criminal justice system will be used as a case study example involving a criminally involved population to consider the strengths and weaknesses of this method.

MOMENTUM TRANSFER IN TWISTED PARTICLE COLLISIONS

Presenter	Plumadore, Alexander Undergraduate, Physics
Mentors	Prof. Allison Harris
Authors	Alexander Plumadore; Allison Harris

Humanity has been striving to understand the universe for thousands of years. Today, this understanding has taken a leap forward as a new advancement called electron vortex beams are being used to probe deeper into the unknown. These new beams have a unique twisting that leads to potential applications in communications, microscopy, astronomy, and identification of atomic structures. In order to access these applications, a fundamental understanding of these twisted beams, and their interactions with matter, is required. To gain deeper insight into twisted beam interactions with matter, we calculate ionization cross sections for electron vortex beam collisions with hydrogen. These cross sections show signatures of the target structure and provide more information than non-vortex collisions.

BODY COMPOSITION CHANGES IN MEN AND WOMEN OVER 12 MONTHS OF TRAINING

Presenter	Rafferty, Jake Undergraduate, Kinesiology & Recreation
Mentor	Prof. Kristen Lagally
Co-Mentor	Prof. Peter Smith
Authors	Jacob Remmert; Jake Rafferty; Peter Smith; Kristen Lagally

Maintaining a healthy body composition is a key factor for the reduction of disease risk and the improvement of body satisfaction. Health club Personal- and Small-Group-Training services promote cardiovascular and resistance exercise to a wide population to achieve these ends. InBody technology utilizes bioelectrical impedance to quickly measure body composition and may be used to determine changes in muscle and body fat as a result of training over time. **PURPOSE:** To examine body composition changes over time in a large group of active, resistance training adults. **METHODS:** 293 adults aged 18-78 (M = 40.11, SD = 13.11) who were taking part in individual or group personal training served as the participants for this research. Participants underwent a baseline InBody assessment and then repeated the InBody assessment at least once within a twelve-month period. Skeletal Muscle Mass (SMM) and Percent Body Fat (PBF) were compared between baseline and month 1, baseline and month 2, etc. for each sex separately. Not all participants had assessments performed each month, therefore the N varies across the different timeframes. **RESULTS:** Significant changes in males only emerged in PBF, in 5 of the 12 comparisons (pretest with months 1-3, 5, 8). Effect sizes for these significant comparisons ranged from 0.72 (Pretest [M = 25.60, SD = 10.87] vs. Month 5 [M = 23.35, SD = 10.37]) to 0.36. Significant improvements in females arose in both SMM (7 of the 12 comparisons: pretest with months 4-7, 9-10, and 12) and PBF (9 of the 12 comparisons: pretest with months 1-8, and 11). Effect sizes in SMM ranged from 0.70 (Pretest [M = 56.14, SD = 11.78] vs. Month 10 [M = 57.30, SD = 11.71]) to 0.355. Effect sizes in PBF ranged from 0.74 (Pretest [M = 34.40, SD = 8.98] vs. Month 2 [M = 33.01, SD = 8.88]) to 0.47. **CONCLUSION:** Our results indicate that participation in regular personal training was effective for eliciting positive changes in body composition over time. The data suggest that while females improved both PBF and SMM over the timeframe measured, males only improved PBF.

SIMULATING THE DYNAMICS OF A SPACE ELEVATOR

Presenter

Read, Andrew
Undergraduate, Physics

Mentor

Prof. Matt Caplan

Current methods of space travel require exorbitant sums of resources to transport relatively small amounts of resources into orbit. The price of sending one kilogram of stuff to the ISS is on the order of a few thousand dollars, not to mention the carbon emissions produced by sending it there. What if there was a cheaper, more efficient way of putting materials into earth's orbit and beyond? What if we had an elevator that went all the way into space that could safely and reliably move materials to and from orbit? What would this so called 'space elevator' look like, and how would it behave?

The purpose of our research was to produce a simulation of this so called 'space elevator' to study their stability. The elevator itself would have to be many thousands of kilometers long, long past geosynchronous orbit, in order to be self-supporting. This means the elevator spans effectively all heights for orbiting satellites. A collision event would be catastrophic, so accurate predictions must be made of the elevator's future position. Further, the elevator should be able to be driven such that if a collision is predicted, the elevator can move out the way.

Initial simulations of our space elevator show that when perturbed, the elevator experiences two main oscillatory motions. There are large global oscillations not unlike a simple pendulum, and there are smaller higher order oscillations along the length of the elevator much like a guitar string. These large global oscillations of the space elevator are both easy to predict, and easy to correct via a driving force. Unfortunately the higher order oscillations may be extremely chaotic. Thus, predictions of the space elevator's position can only be known up to some uncertainty based on how strongly the elevator is perturbed from equilibrium

PECTIN METABOLISM IN ARABIDOPSIS TRICHOMES PROMOTES PAPILLAE DEVELOPMENT

Presenter	Rickerd, Trevor Graduate, Biological Sciences
Mentor	Prof. Viktor Kirik
Authors	Trevor Rickerd; Christy Fornero; Gabrielle Dowell; Viktor Kirik

Plant cell walls are used in dynamic ways to perform a variety of functions, such as mechanical support, cell shape, transport of solutes, and defense from pathogens. Specialized cell types can organize their cell walls in unique ways pertinent to their function. Trichomes, or plant hairs, develop relatively thick cell walls that develop small, round, opaque structures called papillae in late-stage cell wall development.

Our work focuses on the glassy hair 3 (glh3) mutation that results in a "glassy", transparent trichome phenotype, caused by the lack of developed papillae structures on the trichome's cell wall. We found that a gene encoding a putative Pectate Lyase enzyme (PLY21) has a mutation in a theoretical calcium binding site, resulting in the loss of these papillae structures. We found PLY21 expression in trichomes and floral organs using promoter-GUS gene expression assays. Our results show that the mediator complex is involved in PLY21 expression in trichome cells; when the mediator complex is broken, PLY21 is not expressed and papillae do not form. We utilized scanning electron microscopy to quantify the number and density of papillae on trichomes of wild-type, mutant, and rescue plants. We found that the GFP-Pectate Lyase is secreted across the cell membrane and localizes specifically to the papillae of the cell. We have designed fluorescent constructs combined with the N-terminal signal peptide of the PLY21 enzyme to determine if the N-terminal signal peptide is sufficient to allow proteins to be secreted across the membrane into papillae. To determine the mechanism by which PLY21 is secreted across the cell membrane, we performed a Brefeldin A trafficking blocker assay with our fluorescent PLY21 construct. To determine whether the degree of methylesterification influences papillae formation, we have expressed a pectin methylesterase inhibitor with a trichome-specific promoter to prevent the removal of methyl groups from pectin in the cell wall.

OFFICIAL MISCONDUCT IN WRONGFUL CONVICTION CASES PRIOR TO 1989

Presenter

Rivers, Davey

Undergraduate, Criminal Justice Sciences

Mentor

Prof. Michael Gizzi

No system is without its shortcomings, and the legal system is no different. In the instance of a wrongful conviction, appeals may be filed for further examination of the case. When an individual who was wrongly convicted is released because of an error made within the Criminal Justice System, this is called an exoneration. My research examines trends within exoneration cases containing official misconduct prior to 1989, when DNA evidence became commonly used in courts. Through data collected from the National Registry of Exonerations, I have outlined the common causes of wrongful conviction from both police officers and prosecutors. Results showed that the most common form of police misconduct leading to wrongful conviction was coercing a false confession. That factor was followed closely by violence or the threat of it and framing the suspect. These three forms of police misconduct frequently occurred together in the narrative of police beating a false confession out of their suspect and then using that as evidence in court. Prosecutorial misconduct was largely centered around mishandling or withholding evidence in order to obtain the conviction.

THE EXACT PREDICTABLE FUNCTIONS BY A SINGLE NEURON

Presenter	Rizo, Luis Undergraduate, Physics
Mentors	Prof. Xing Fang, Q. Charles Su, Rainer Grobe
Authors	Luis Rizo; Xing Fang; Q. Charles Su; Rainer Grobe

Artificial neuro network (ANN) has demonstrated its powerful utility in many areas of research such as language parsing and image recognition. In this work we apply ANN technique to physics research. In particular we are inspired by ANN's possible applications in summing diverging series obtained from analyzing the bound state of atoms and molecules as well as the computation of particle spatial density during the light-induced particle creation process where the precise definition of particle is difficult. We train a single neuron with inputs from data associated with the so-called exact predictable function (EPF) and demonstrate that their future output values from the neuron would be free of error. With the help of the sum and product rules, we show many more EPF can be recovered. The weights obtained in training the EPF may serve as better initial values to more completed ANN. This work has been supported by the NSF and Research Corporation.

THE ROLE OF WORKING MEMORY IN DIRECTION GIVING AND WAYFINDING

Presenter	Roberts, Darin Undergraduate, Psychology
Mentor	Prof. Alycia Hund
Authors	Alycia Hund; Darin Roberts

An important task in our everyday lives is finding our way around and helping others find their way. To do these tasks, we must rely on working memory, which is necessary when holding onto information while performing other tasks. We used Baddeley and Hitch's model to conceptualize four aspects of working memory. The first aspect is the central executive, which is the main processing unit of working memory. Second, the visuospatial sketch stores visual semantics like visual and spatial details, and third, the phonological loop stores verbal information such as language. The last aspect is the episodic buffer, which is responsible for holding onto multidimensional chunks of information (Baddeley, 2009). Past research has linked working memory and wayfinding. For example, indoor wayfinding directions were less accurate when visuospatial working memory was being taxed by a secondary task. Indoor wayfinding times were also found to be slower when visuospatial memory was being taxed (Hund, 2016). The present study investigated the role of working memory in direction giving and wayfinding in an outdoor environment. The sample consisted of 257 participants recruited from Illinois State University. We tested the role of working memory in direction giving and wayfinding through a dual-task paradigm. The dual tasks included being able to tell if a word was a real English word or not (taxing verbal working memory) or making decisions about times on an analog clock (taxing visuospatial working memory) while simultaneously giving directions or finding the best route to a specific destination on the university quad, compared to simply giving directions or wayfinding. Preliminary analyses supported our hypotheses. That is, participants made more errors in direction giving when working memory was being taxed during dual-tasks. They also were slower during wayfinding. These findings provide important details about the role of verbal and visuospatial working memory in wayfinding and direction giving.

INVESTIGATION OF POLARIZATION EFFECTS ON INTRAMOLECULAR OXIDOPYRYLIUM-ALKENE [5+2] CYCLOADDITIONS

Presenter	Rokey, Samantha Undergraduate, Chemistry
Mentor	Prof. T. Andrew Mitchell
Authors	Samantha Rokey; Adam Youman; John Goodell; T. Andrew Mitchell

In organic chemistry, the Diels-Alder reaction is a reliable way to synthesize six-membered rings with good control over stereochemistry. Less known are the mechanistic aspects of seven-membered ring construction. In contrast to Diels-Alder [4+2] cycloadditions, [5+2] cycloaddition mechanisms are more complex and thus have greater limitations such as a propensity to dimerize and variable regioselectivity and diastereoselectivity. Nevertheless, [5+2] cycloadditions are important reactions to synthesize polycyclic ring structures that are part of many biologically active natural products. For this study, both kojic acid and maltol based derivatives will be synthesized and evaluated in relative reaction rate studies utilizing an internal standard for a more reliable comparative analysis. From this collected data, a Hammett plot can be created giving preliminary insight into potential mechanism pathways due to differing of substrate electronics.

ASSESSING THE ROLE OF DILUTION IN A SATURATED BUFFER ZONE UTILIZING ION AND DYE TRACERS

Presenter	Schukow, Elijah Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson
Author	Elijah Schukow

Throughout the Midwest, the application of fertilizers for agricultural usage is one of the leading causes of surface and groundwater pollution. Excess application of nutrients causes an introduction to water bodies. This nutrient introduction, specifically nitrate, is the leading cause of hypoxia in the Gulf of Mexico. Across the Midwest, tile drains move water from agricultural fields, which introduces concentrated discharge directly into waterways. Saturated Buffer Zones are areas of land that lie adjacent to water bodies and can have a significant impact on reducing nutrients being introduced to the waterways. Nutrient reduction in a saturated buffer zone occurs through denitrification, assimilation, and dilution. The extent that these processes occur can't be calculated without knowing the residence time. The longer the residence time, the longer waters can interact with the saturated buffer zone. The objectives of this study are to use various tracer test methods to determine the flow path of water through a saturated buffer zone and determine the residence time of water in a saturated buffer zone. Overall, quantifying these variables will allow for a better understanding of the rate and efficiency of saturated buffer zones.

THE CUSTOMER JOURNEY OF INTO STUDENTS AT ISU

Presenter	Scott, Taylor
	Undergraduate, Marketing
Mentor	Prof. Steven Taylor
Author	Taylor Scott

Based on the emerging marketing literature, this project maps the customer journey of the INTO populations of undergraduate and graduate students at ISU. The customer journey is organized into several key steps, including: (1) choosing INTO, (2) choosing ISU through the INTO program, (3) applying to ISU, (4) physically coming to ISU from abroad, (5) navigating the first semester, and (6) academic and social experience. Major insights include: (1) Overall, the experience of INTO students is generally positive; (2) The distinctive advantage of ISU vis-à-vis INTO involves not having to take the MCAT to apply; and (3) There appear issues related to housing and students not taking advantage of extracurricular resources that represent opportunities to enhance the experience of these students. The results suggest continued study of the INTO population with an eye toward stronger assimilation into the Redbird experience.

"MOTHER NATURE SAYS, #METOO"

Presenter

Selburg, Kyli

Undergraduate, Philosophy

Mentor

Prof. Eric Godoy

In my project, "Mother Nature Says, #MeToo" I aim to draw upon the inextricable link between gender and the environment invoked in dualistic language that moves to justify the domination of both women and the environment. I focus on analyzing pervasive dualisms, such as male/female, human/environment, and human/nonhuman animal within the epistemic community of Western patriarchal culture to then argue through philosophy of language how these dualisms we use uphold hierarchies and structure power. The way we use language reveals how we value and thus interact with the subjects of the dualism. I then draw upon the works of Carol Adams to explicate a specific language move that works to remove the status of moral being of a thing, directly linking violence against women and nonhuman animals. In conclusion, I argue that through understanding the axiology and epistemology that informs the oppression of women and the environment, we can work to structure a more polymorphous society and mitigate the environmental existential threats we have created for ourselves.

LIGHT CONTROLLABLE KINESIN MOTORS

Presenter	Shahin, Mazen Undergraduate, Biological Sciences
Mentor	Prof. Martin F. Engelke
Authors	Martin F. Engelke; Jessica M. Adams; Mazen Shahin

Mammalian cells are complicated but organized. Motor proteins are molecular machines that use the energy stored in ATP to transport all kinds of molecular cargo along the cytoskeleton and thereby organize the cells. The activity of motor proteins is regulated. In the absence of cargo, motors generally exist in an autoinhibited conformation, which prevents futile ATP consumption. In the presence of cargo, the motor is activated and transports the cargo to its destination. The need for motor protein-mediated transport can be exemplified in cilia, which are hair-like protrusions of the plasma membrane, supported by a microtubule-based structure. Cilia are present on the surface of nearly all cells in the human body and play important roles during development and adult physiology. Removal of the gene coding for a specific motor protein, called kinesin-2, results in the inability of cells to grow cilia. Interestingly, a kinesin-2 version that cannot autoinhibit is not able to rescue cilium outgrowth. This indicates that kinesin-2 has to be able to switch between the inactive and active conformation to support cilium outgrowth. In my project, we will address the question of where in the cell kinesin-2 has to be activated to mediate cilium outgrowth. To do this, we will generate kinesin-2 motors whose activity can be controlled by light. Using a laser scanning confocal microscope, we will selectively illuminate different regions in cells that express the light controllable motor. At the same time, we will monitor cilia outgrowth using live-cell cilium membrane markers. The results from this work will shed light on the requirements for kinesin-2 regulation to support cilium outgrowth.

RELATING NUTRIENT UPTAKE AND METABOLISM IN URBAN CEMENT LINED STREAMS

Presenter Sieggreen, Grace
Graduate, Geography, Geology, and the Environment
Mentor Prof. Catherine O'Reilly
Authors Catherine O'Reilly; Bill Perry; Eric Peterson

Improving water quality is a critical societal issue. Declines in water quality have been associated with nutrient inputs from land use. Removal of nutrient in a stream is possible through uptake by biotic processes (algae and microbes). This uptake of nutrients is monitored by measuring the rate of retention or uptake. Previous studies show that nutrient uptake is affected by biotic activity or metabolism, furthermore, metabolism can be affected by the present biota type and storm events. Yet these studies are restricted to environments other than cement-lined streams, which can be common in urban landscapes. Therefore, this study's goal is to find the connection between nutrient removal and the biotic metabolism while considering the impact that algae type and storm events have in a cement-lined stream.

I studied nutrient uptake and metabolism in a cement lined stream in Bloomington, Illinois during June-October 2019. I measured metabolism by deploying dissolved oxygen and photosynthetic light loggers at stream sites. In addition, I documented discharge rates and storm events. I measured the uptake rates for ammonium and phosphate with a nutrient addition experiment and collected algae samples. I analyzed the water samples in LEA for ammonia and phosphorus concentrations with an Ion Chromatograph and a flow injection analyzer. I analyzed the algae samples with a microscope and classified them as a green or blue-green alga based on their genus.

The metabolism of the stream was net heterotrophic with a community respiration (CR) of 0.08 - 11.5 g O₂/m²/day and gross primary productivity (GPP) of 0.0 - 6.31 g O₂/m²/day. The stream primarily hosted green algae, which appeared to promote increased GPP in the stream. Both CR and GPP decreased after storm events due to high discharge scouring algae from the stream bed. However, CR recovered faster than GPP, most likely from increased microbial populations and organic matter substrate being transported from upstream during the high discharge flows. Uptake values for PO₄-3 were 1.42 - 6.97 mm/min and NH₄ uptake values were 2.71 - 11.6 mm/min. In comparison to other studies the uptake values are moderate, while the maximum NH₄ uptake is slightly elevated showing that PO₄-3 is most likely the limiting nutrient. The relationship between the nutrient uptake and metabolism was very weak, therefore it is assumed that there must be another factor affecting nutrient uptake in cement lined streams.

INVESTIGATING THE ROLE OF IMMUNITY IN THE COLONIZATION SPECIFICITY OF A BUMBLE BEE GUT SYMBIONT

Presenter

Sierra - Rivera, Bryan
Graduate, Biological Sciences

Mentor

Prof. Benjamin Sadd

In the past decade, the gut microbiome has gained traction as an avenue of importance across taxonomical groups to better understand its implications for host health. Bacterial species within the gut must endure harmful conditions such as lack of nutrients, attack by the host immune system and potential negative interactions with other community members leading to evolutionary pressure for local adaptation. Although studying the gut microbiota in humans is difficult due to a high species richness, many of which are unculturable in laboratory settings, the bumble bee gut serves as a tractable system due to only being comprised of nine core bacterial species clusters. Past research has suggested host - strain specific establishment of gut microbes from honeybees to bumble bees, but no studies have been conducted on higher-level specificity within bumble bees or the role of immunity as a driver of specialization. To investigate the role of colonization specificity of a bumble bee gut symbiont, native and foreign bacterial strains will be inoculated into *Bombus impatiens* to test whether native strains better colonize their hosts than foreign strains. I will then focus on the role of the host's innate immune system in the relationship between the co-evolved beneficial gut microbe and its host. To address this, RNA seq will be utilized to compare host immune gene expression in response to the native and foreign inoculations.

CHARACTERIZING CHANGES IN NONSCIENTISTS' KNOWLEDGE OF EVOLUTION IN INTRODUCTORY BIOLOGY

Presenter	Sparks, Rachel Graduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authors	Rachel Sparks; Rebekka Darner

In the current social, political, and environmental climate of the United States, it is critical for nonscientists to have a firm knowledge of evolution in order to make informed decisions about issues including vaccination, climate change, and biotechnology, among many others. Literature on the teaching and learning of evolution indicates that there are gaps in students' understanding of evolution, particularly as it applies to their daily lives. Thus, an introductory biology course taught through an evolutionary perspective was developed and implemented in 2017, then revised and re-implemented in the 2018-2019 academic year. Data from the re-implementation shows that overall, students' knowledge of evolution significantly increased on a content knowledge assessment. However, the reasons behind this change are unknown and likely vary from student to student. In order to elucidate how students' knowledge changed throughout the course, qualitative data from nine students who completed the pre- and post-assessments were analyzed using open coding and thematic analysis to identify patterns within student knowledge. This poster will present case studies of several students' change in knowledge throughout the course, using excerpts from student work to illuminate how class activities and experiences impacted students' evolutionary knowledge.

SEASONAL FISH KILL CONTROLS WITHIN A SMALL LAKE IN BLOOMINGTON, ILLINOIS

Presenter	Spooner, Emmett Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson
Co-Mentor	Prof. Bill Perry
Authors	Eric Peterson; Bill Perry; Gare Ambrose-igho; Patience Bosompemma; Ashley Divincenzo; Preston Konop; Christine Salinas; Grace Sieggreen; Osahon Ukpebor

Shallow lakes are prone to a depletion of dissolved oxygen in the summer and winter months, which can lead to fish kills. Oxygen depletion can be caused by diurnal fluctuations in oxygen generation. During the day, algae generate oxygen and consume it at night. A disruption in this cycle caused by phytoplankton die-off, lake destratification, or high concentrations of nitrate or phosphate can alter the dissolved oxygen content of the lake and lead to fish kills. The Lakeside Country Club in Bloomington, Illinois is home to a small (0.025 km²), shallow lake, with a maximum depth of 4.7 m, that experiences seasonal fish kills. With no inputs other than direct runoff from the golf course, fertilizer runoff from the course serves as the sole point source for nutrients in the lake. With many uncertainties of the urbanized lake and the land surrounding the lake, it was necessary to collect initial survey data. A bathymetry survey along with vertical profiles of temperature, dissolved oxygen (DO), pH, and specific conductance at 0.5 m interval depths were completed in May of 2019. In addition, two buoys with temperature and light intensity loggers were deployed in the central part of the lake to record measurements every 15 minutes at depth intervals of 0.3 meters. At four locations, water samples were collected from the surface and at the bottom for analyses of major anions (Cl⁻, NO₃-N, PO₄³⁻, SO₄²⁻) and phosphorus (P). The data revealed several trends: 1) pH decreases as depth increases, 2) temperature decreases as depth increases and does not indicate stratification (Surface: 19.5 °C; 3 meters below surface: 15.5 °C), 3) DO decreases as depth increases, yet remains suitable for aquatic life (Surface: 11 mg/L; 3 meters below surface: 4 mg/L), and 4) specific conductance remains relatively constant with changing depth (633 µS/cm). The anion data illustrated that the lake is chemically well-mixed vertically and horizontally. NO₃-N and P concentrations were low, 0.43 mg/L and 23.4 mg/L, respectively. Currently, the causes of fish kills, which includes phytoplankton die-off, lake destratification, high concentrations of nitrate or phosphate, do not appear to be apparent in the gathered data. Additional data will be collected in the winter months to determine temporal variations and gain an insight into DO variations.

DECIPHERING THE FUNCTION OF A SULFOLOBUS ISLANDICUS LEUCYL-TRNA SYNTHETASE PARALOG USING CHIMERIC PROTEINS

Presenter	Steffen, Marcus Undergraduate, Chemistry
Mentor	Prof. Christopher S. Weitzel
Authors	Marcus Steffen; Kristen K. Eilts; Christopher S. Weitzel

One of the most important molecular processes within an organism is the accurate synthesis of proteins from mRNAs programmed within the genetic code. Many enzymes play important roles in this process, particularly the aminoacyl-tRNA synthetases (aaRSs). The primary function of these ancient enzymes is to attach the correct amino acid to their respective tRNA/s. These aminoacylated, or charged, tRNAs then move to the ribosome where the amino acids are transferred to a growing polypeptide chain. Under study is a leucyl-tRNA synthetase (LeuRS) duplication in the archaeal extremophile *Sulfolobus islandicus*. One paralog, LeuRS-F, has a robust capacity to charge leucine to its cognate tRNAs while the second LeuRS-like protein, LeuRS-I, does not despite maintaining an ability to activate leucine and bind tRNA^{Leu}. Alignments between these paralogs reveal the largest sequence variation to exist between their C-terminal domains, a region known to be important for Archaeal LeuRS to correctly recognize tRNA^{Leu}. We, therefore, hypothesize that swapping the C-terminal domain of LeuRS-I with that of LeuRS-F may impart aminoacylation activity to the resulting chimera. Consequently, two second-generation chimeras have been constructed via recombinant DNA technology, overexpressed as N-terminal His-tag fusions within *Escherichia coli*, and purified using nickel-affinity chromatography. The preliminary characterization of these chimeras will be presented.

SOLID-PHASE SYNTHESIS OF GOLD NANOPARTICLE-PROTEIN CONJUGATES AS A NOVEL METHOD FOR ROBUST ASSAY

Presenter

Strandquist, Evan

Undergraduate, Chemistry

Mentor

Prof. Jeremy Driskell

Authors

Evan Strandquist; Kiran Tripathi; Jeremy Driskell

Bioconjugation of antibodies onto gold nanoparticles is of great interest due to the implications on novel, cost-effective bioanalytical assays. Critical to the success of such assays is the incubation of antibody to reliably synthesize stable conjugates. Understanding this fundamental interaction between antibody and gold nanoparticle is essential for successful downstream applications. The effects of pH, ionic strength, and protein concentration are factors that affect the antibody loading, orientation, and overall conjugate stability. However, electrostatic bridging of nanoparticles by protein at certain pHs and moderate to high ionic strength restricts mechanistic studies of protein adsorption to a narrow set of solution conditions. A novel synthetic pathway involving the immobilization of gold nanoparticles on an APTES modified glass surface prior to the addition of antibody potentially restricts the possible modes of aggregation and allows for further studies of incubation conditions inaccessible by conventional synthetic pathways. Experimental results show an excitingly well-behaved solid-phase conjugate that may be synthesized in conditions that would otherwise lead to premature aggregation in conventionally synthesized conjugates.

DYNAMIC CHANGES IN YOLK STEROID LEVELS IN EGGS DURING DEVELOPMENT

Presenter	Sudbrook, Teagan Undergraduate, Biological Sciences
Mentor	Prof. Ryan Paitz
Authors	Teagan Sudbrook; Ryan Paitz

The early endocrine environment is important to embryonic development because steroid exposure can induce permanent effects on offspring. In birds, maternal steroids are present in the yolk, which is thought to occur because steroids are lipophilic and the yolk has a high lipid content. Numerous steroids can be detected in bird yolks, with progestogens such as progesterone, pregnenolone, 17 α -hydroxypregnenolone, pregnanedione, and pregnanolone being more abundant than the androgens. Once incubation begins, many of these steroids are subject to metabolism by the embryo in ovo, but very little is known about the specific routes of metabolism or what happens to steroids in the yolk during the later stages of development. To examine how steroid levels in the yolk change throughout development, chicken eggs were incubated and frozen at days 3, 6, 9, 12, and 15 of development and steroid levels in the yolk were quantified using LC/MS/MS. We found that some steroids, such as pregnenolone, etiocholanolone, progesterone, pregnanedione, and pregnanolone, showed a drop in concentration early in development but levels then transiently rose during the middle stages of development before dropping again after day 12. Our current interpretation of these findings is that maternally derived steroids that are present at the onset of development are metabolized before the embryo starts producing steroids that can be detected in the yolk. Towards the end of development, the embryonic steroids in the yolk are metabolized. Overall, these data suggest that steroid levels in the yolk of bird eggs are dynamic over the course of development, going through several periods of being elevated and then subsequently metabolized. The specific mechanisms regulating these changes in yolk steroid levels are currently being investigated.

EFFECTS OF DIAMAGNETISM ON MAGNETOTAIL CURRENT SHEET EQUILIBRIUM

Presenter	Sullivan-Wood, Jonathan
	Undergraduate, Physics
Mentor	Dr. Holland

A commonly used analytic model for magnetic field reversals is the Harris equilibrium. In this model, the particle motion is completely integrable, and is characterized by a strongly peaked (in z) density profile that asymptotically approaches zero, and a magnetic field that varies in z , but points in the x direction. When we allow for normal component to the current sheet of the magnetic field, the particle dynamics are nonintegrable, and frequently chaotic. We have developed a test-particle simulation method for calculating the self-consistent equilibrium of the earth's magnetotail that fully incorporates the nonlinear/chaotic charged particle dynamics of the ions. The equilibrium of the magnetic field is qualitatively similar to the Harris model, but the density is asymptotically constant and the current is created by a completely different mechanism. We show that the current density can be broken into a free current density and a bound current density. The free current is formed by the meandering motion of ions in the vicinity of the field reversal, and the bound current is caused by plasma diamagnetism. Furthermore, the more field aligned the ion sources are in the asymptotic region, the thinner the current sheet, the more peaked the density profile, and the smaller the effects of diamagnetism.

DECIPHERING DEFENSE MECHANISMS TO REACTIVE CHLORINE SPECIES IN UROPATHOGENIC E. COLI

Presenter	Sultana, Sadia Graduate, Biological Sciences
Mentor	Prof. Jan-Ulrik Dahl
Authors	Sadia Sultana; Jan-Ulrik Dahl

With 150 million cases worldwide each year, urinary tract infections (UTIs) are among the most common bacterial infections representing a significant burden on healthcare cost. UTIs differ from other bacterial infections in that they are particularly common in women even in otherwise healthy young individuals and often lead to recurrent infections. UTIs are mainly caused by Uropathogenic Escherichia coli (UPEC), which reside as harmless commensals in the gut and become pathogenic upon entry into the urinary tract, where they colonize and persist in the bladder and kidney. Once present in the urinary tract, UPEC is confronted with increased levels of hypochlorous acid (HOCl), a potent oxidant produced as antimicrobial strategy by cells of the innate immune defense and uroepithelial cells. I recently made the intriguing discovery that UPEC strains are substantially more resistant to HOCl than other intestinal bacteria. This is particularly interesting given that comparative genomic studies reveal the presence of ~850 additional genes in UPEC, which are known to contribute to their virulence and persistence in the host. However, the mechanism(s) by which UPEC responds to and defends HOCl are still completely unexplored. Therefore, my goal is to fill the gap in knowledge by identifying and deciphering UPEC-specific defense mechanisms towards HOCl stress, which has the potential to reveal novel drug targets that sensitize UPEC to neutrophil-mediated HOCl exposure and therefore might increase the efficacy of bacterial clearance by neutrophils. Initially I am focusing on one yet to be characterized UPEC-specific transcriptional regulator that showed significant upregulation under HOCl stress in microarray analysis. I confirmed the elevated expression of that putative transcriptional regulator and its target genes under HOCl stress by quantitative Real Time-PCR (RT-PCR). Phenotypic analysis by creating deletion mutants of the regulator target gene in UPEC shown significant sensitivity towards HOCl then the wild type. Now, I will perform phenotypic analysis of the transcriptional regulator deletion mutant with wild type. Meanwhile, will also focus on the characterization of the activation mechanism of the transcriptional regulator during HOCl stress. Given the rise of antibiotic resistant infection, my project has the potential to discover novel UPEC-specific drug targets which might serve as effective alternatives to reduce the development of antibiotic resistance through increasing the host's own ability to fend off infections.

USING THE FITZHUGH-NAGUMO MATHEMATICAL MODEL TO STUDY THE EFFECTS OF ADJUSTING CHANNEL PERMEABILITY ON NEURONAL SPIKING

Presenter	Swift, Hannah Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Authors	Hannah Swift; Ian Freeman

The efficiency of neuronal signaling relies on several microstructures in the cell; one example is the permeability of ion channels in the neuron. It is known that changes to the permeability of ion channels can affect the physiological success of the neuron. To theoretically examine the effects of these changes on the neuron, the FitzHugh-Nagumo mathematical model was employed to verify how varying the conductance of ionic channels affect the neuronal output. The FitzHugh-Nagumo model is a simplified version of the Hodgkin-Huxley equations, and is designed to generate both tonic and bursting outputs, depending on the choice of parameter values. Additionally, rather than having four variables as the Hodgkin-Huxley model, the FitzHugh-Nagumo model focuses on two variables. An important aspect of the physiology of a neuron is electrical signaling and voltage-dependent membrane permeability. Passive and active movement of ions create a differential in the distribution of ions across the membrane, resulting in the production of a selectivity permeable membrane. The active and passive movement of ions is controlled by ion channels and transporters. Two crucial channels that permit the flow of ions and control permeability of the ions are sodium and potassium channels. The performance of these two channels has a direct relationship to the overall behavior of a neuron, with neurons typical output consisting of tonic (continued firing at a fixed rate) and phasic, or bursting, where the neuron output alternates between periods of fast spiking and periods of silence. Our results are consistent with the expected physiological behavior of the neuron, with the firing rate increasing with increasing sodium conductance and decreasing with increasing potassium conductance.

YOU ONLY HAVE TO BE BRAVE ENOUGH TO SEE IT: EVOLUTION OF GENDER ROLE PORTRAYAL IN DISNEY PRINCESS MOVIES IN VIEW OF WAVES OF FEMINISM

Presenter

Tasmin, Tamanna

Graduate, Communication

Mentor

Prof. John Baldwin

This paper rhetorically analyzes gender role portrayal in Disney princess movies. Disney princess movies have a significant impact on how society defines gender roles as it is a prominent voice of the entertainment world. Disney has successfully commercialized the concept of being a princess feeding on a century-old fantasy. Each of their movies' centers around a female lead. Although they vary in the storyline, the gender role portrayal in these movies remains similar. From dependent, delicate and domesticated to independent, bold and adventurous features of their heroines, Disney princess movies have shifted their concentration briskly. At an initial stage, Disney portrayed stereotypical notions of women in their movies. Gradually, accepting the changes in society, Disney adapted their storylines. In this paper, I will identify whether the recent uprising and previous waves of feminism, have any influence on these movies and to what extent the characteristics of princesses changed from past to new princess movies. To do this, I have categorized the most popular Disney princess movies in three generations - the conventional princess (1939 - 1959), the transitional princess (1980s and 1990s) and the modern princess (2000 till now). After introductory discussion, this paper discusses gender roles in media followed by three generations of Disney princesses and concludes with a discussion of this shift in the storyline, in line with the waves of feminism.

EXAMINING THE EFFECT OF THE SIX DIMENSIONS OF PARENTING STYLES ON PERFECTIONISM

Presenter

Taylor, Dorothy
Undergraduate, Psychology

Mentor

Prof. Jeffrey Kahn

Maladaptive perfectionism is associated with various negative consequences on an individual's health including depression and social anxiety (Kawamura, Hunt, Frost, & DiBartolo, 2001). Considering this, understanding potential causes of perfectionism is important for prevention and treatment. As described by the Perfectionism Social Disconnection Model, perfectionism can develop as a result of an excessive desire to belong within interpersonal relationships that is unable to be met (Chen, Hewitt, Flett, Cassels, Birch, & Blasberg, 2012). This can include the relationship between parent and child; in fact, parental perfectionism is found to correlate with perfectionism in children. Vieth and Trull (1999) found that self-oriented perfectionism predicted self-oriented perfectionism in their children. Similarly, parental characteristics such as being perceived as authoritarian was associated with more concerns over mistakes and doubts about actions within Asian American families (Kawamura, Frost, & Harmatz, 2002). While traditional categorizations of parenting styles are useful, they assume a bipolar relationship amongst characteristics (e.g., high in warmth must be low in rejection) Skinner, Johnson, and Snyder (2005), on the other hand proposed a multidimensional model of parenting which distinguishes warmth, rejection, structure, chaos, autonomy support, and coercion. Their model offers a wider range of combining traits in which parents can have, theoretically. This study will examine parenting styles through the multidimensional model described by Skinner, and the effect certain features of parenting have on the manifestation of perfectionism on their college-aged children.

College students will complete a questionnaire that includes the Almost Perfect Scale-Revised (Slaney, Rice, Mobley, Trippi, & Ashby, 2001) which measures adaptive and maladaptive perfectionism through the three subscales: standards, order and discrepancy. Furthermore, the questionnaire will include the Parents as Social Context Questionnaire (Skinner et. al, 2005) which measures the six dimensions of parenting styles.

RESULTS OF A DECORATIVE-FUNCTIONAL ANALYSIS OF PREHISTORIC CERAMICS FROM WESTERN IOWA

Presenter	Thies-Sauder, Meagan Graduate, Sociology/Anthropology
Mentor	Prof. James Skibo
Co-Mentor	Prof. Logan Miller
Author	Meagan Thies-Sauder

This presentation provides the results of a decorative-functional analysis of early Late Woodland (AD 400-600) ceramics from the Sharp's site in western Iowa. My work is focused on determining the relationship between decorative elements and ceramic technology using the Performance-based Life History Approach, that includes a traditional ceramic analysis, a use-alteration analysis, and a decorative analysis. The direct application of this technique provided three prevalent decorative categories with explicit evidence of use. Furthermore, when the results of the decorative-functional analysis and an independent faunal analysis are examined together, an indirect relationship emerges between decoration and vessel function. Through their technical choices during the manufacturing process, the local potter, or local potters, determined the intended techno-function of the vessel. However, it was the recipient that determined the actual techno-function of the vessel, or what was cooked in the pot, based on the amount of work that went into the vessel and the weight of its exchange.

DECONSTRUCTING "THE GRETA EFFECT": ETHICAL REPRESENTATIONS OF CLIMATE ACTIVISM IN CHILDREN'S LITERATURE

Presenter
Mentor

Tidmarsh, Bryanna
Graduate, English
Prof. Mary Moran

From First Nation water protector Autumn Peltier to “Little Miss Flint” Mari Copeny, children all over the world are working to make a difference in their local, national, and global communities of belonging. This is far from a new trend; historically, children have been at the center of many activist movements. And it’s no wonder; whether the topic is climate change or racial and gender equality, children are directly impacted by these discourses while often being denied space to participate in the shaping of legislation and policy.

Yet much recent discourse about youth climate activism cites Swedish climate activist Greta Thunberg as the catalyst for the rise in youth climate activism. News outlets refer to this as a so-called “Greta Effect,” even calling Ugandan activist Vanessa Nakate—who was working for climate justice long before Thunberg—the “Greta of Africa.” Children’s literature, too, perpetuates this dominant narrative with the recent publication of several Greta-themed children’s books. Thunberg herself is critical of this erasure. The centering of one individual white activist in media and literature silences already marginalized voices, and it reduces the impact of a larger collective of young people.

This presentation investigates how children’s literature both reflects and subverts this centering of white individualism in representations of youth climate activism. Philip Nel suggests we “promote books that foster the ‘development of respect for human rights’ and assist in the ‘preparation of the child for responsible life in a free society, in the spirit of understanding, peace, tolerance, equality of sexes, and friendship among all peoples, ethnic, national and religious groups and persons of indigenous origin’” (360-1). Thus, I argue that there are three primary purposes of representing activist movements in children’s literature: (1) to educate children about contemporary and historical movements while promoting empathy and equity; (2) to empower young people to participate in activist discourses, to ask tough questions, and to challenge dominant systems of authority; and (3) to provide concrete examples of the tools, processes, and procedures necessary to making a difference in their communities. In doing this work, ethical representations of activist movements in children’s literature must center marginalized voices, subvert aetonnormativity, and bridge the gap between individual and collective activism, which we see in books such as in *We Are Water Protectors* and *Young Water Protectors: A Story About Standing Rock*.

INVESTIGATIONS INTO THE SYNTHESIS OF BENZIPORPHYRIN AND PYRENIPORPHYRIN DIMERS

Presenter	Tomlovich, Rachel
	Graduate, Chemistry
Mentor	Prof. Timothy Lash

Benziporphyrins, e.g. 1, are porphyrin analogues that incorporate a benzene moiety in place of one of the pyrrolic subunits. Although benziporphyrin is nonaromatic, many derivatives have global diatropic properties. The benziporphyrin cavity can also facilitate the formation of organometallic derivatives. In this work, the formation of dimeric benziporphyrin structures is under investigation. Novel benziporphyrin ethers 1a,b have been synthesized from a tripyrrane 2 and alkoxybenzene dialdehydes 3 using a '3 + 1' MacDonald-type condensation. As expected, these new porphyrinoids show no overall diatropicity, but protonation afforded weakly aromatic dications. In addition, a related ether-linked ester 1c has been prepared and its conversion into amide-linked dimers is being investigated. Furthermore, pyrene-derived tetraketones 4 have been converted into bis-benzitripyrrane-type structures 5 and these have been reacted with a thiophene dicarbinol to generate porphyrinoid products. Poor solubility has limited the characterization of these products and alternative substitution patterns are being considered to overcome these difficulties.

CHARACTERIZING GROUNDWATER STORAGE TREND IN AQUIFER BASIN IN WEST CENTRAL AFRICA USING GRACE SATELLITE DATA

Presenter	Ukpebor, Osahon
	Graduate, Geography, Geology, and the Environment
Mentor	Prof. Wondy Seyoum
Authors	Osahon Ukpebor; Wondy Seyoum

Groundwater remains an important natural resource, which sustain human life and support economic development and ecological diversity. Nearly 2 billion people worldwide depend on groundwater for their daily need. It is estimated that by the year 2025 around 5 billion people, out of the total population of 8 billion people on earth will be experiencing water stress, i.e., water deficit will be more than 20% of their available resources. more specifically, in Africa, about 160 million people currently live under water scarcity status. Therefore, it is imperative to know the amount of groundwater storage available to better manage this irreplaceable natural resource. This study presented in depth analysis of the current available groundwater storage and trends in the largest basins: Chad River and Niger River Basins, in Africa. Satellite-based Terrestrial Water Storage (TWS) from GRACE and global land surface models were used to investigate groundwater trend in the basins. In addition, monthly precipitation data from TRMM 3B43 with a spatial resolution of 0.25o x 0.250, which has a global coverage of (50 S and 50 N) were used. The Standard precipitation Index was used to evaluate the impact of climate extremes, for example drought on terrestrial water storage in the basin. The Mann-Kendall statistical tool was used to detect the significant of trends in climate and hydrological data in relation to the basin. The research will help to understand if climate change, human activities, drought, and increase in population influences groundwater storage in Niger and Chad Basin in Western Africa, and if there is any trend or anomaly in the water storage in this basin.

AN EVALUATION OF THE EFFECT OF WORKFORCE DIVERSITY AND ORGANIZATIONAL LEVEL OUTCOMES AMONG FORTUNE 500 COMPANIES

Presenter	Ukweni, Ngozi Graduate, Business Administration
Mentor	Prof. Tina Thompson
Authors	Ngozi Ukweni; Tina Thompson

Diversity and Inclusion (D&I) goes beyond filling the organization with a representational quota of minority groups. Diversity quotas alone are in comprehensive as it measures the presence of minority groups in the organization and not how much power they have in making decisions that influence organizational level outcomes (OLO). This research will examine issues related to workplace D&I in the U.S. and Barbados. With both countries being demographically dissimilar, this research aims to study the evolution of D&I in the workplace using historical perspectives in a rich, multicultural environment.

Forbes (2017) reported that white men account for 72% of corporate leadership in Fortune 500 companies. The companies surveyed include the data of over 800,000 employees from the CEO through service staff. Alarming, the support for diversity is fading away, PWC (2019) reported that "The percentage of directors saying that gender diversity is very important on their boards fell to 38%-a level not seen in our survey since 2014". The percentage saying the same about racial/ethnic diversity fell from 34% to 26%, and the figures for age diversity fell from 21% to 14%. Diversity will not happen naturally overtime when the criteria for selecting and retaining senior employees are fundamentally biased resulting in a similar search that aligns with the status quo. This empirical research seeks to evaluate the effect of D&I in the senior level employee on OLO in Fortune 500 organizations.

The research methodology will combine correlation and regression to establish the relationship between the D&I and OLO. Independent variable measured by employee composition (race, gender) and the dependent variable with proxies such as Earnings before Interest and Tax (EBIT), Return on Assets (ROA), Market to Book Value (MBV).

The significance of the study is the importance of human differences within a business and understanding the legal, moral and financial implications of these biases.

FINANCIAL DEVELOPMENT AND INEQUALITY IN MIDDLE EAST COUNTRIES: A TIME-SERIES ANALYSIS

Presenter

Vaez, Sara

Graduate, Economics

Mentor

Prof. Oguzhan Dincer

The relationship between financial development and economic growth rate is well established in the economics literature. However, the impact of financial development, in public and private sectors, on income inequalities, still requires more investigation. Income inequality is one of the most economic challenges facing most countries. In this research project, we replicate the study of the financial development's impact on income inequality in India (Ang, 2010) in order to shed light on the same phenomenon in other middle eastern countries (e.g., Iran). We will aim to curate and analyze an annual time series data for a period of time and compare our results with those reported in the original study. The project will share details of the empirical framework proposed in the original research projects and our modification thereof. The findings of this project will provide insights on

DEVELOPING AND ESTIMATING NANO SENSOR FOR MOVEMENT ANALYSIS AND BIOFEEDBACK

Presenter

Vasudevaraja, Umaiyaal
Graduate, Kinesiology & Recreation

Mentor

Prof. Adam E. Jagodinsky

Clinicians are in a need to find the efficient way to provide better health measures in the field of postural stability. The paper will be presenting if the new measurement system that is designed to measure the postural stability plays a prominent role in comparison to the customary motion capture (VICON) systems. The new measurement system is based on a 9 Direction of Force Sensor that is connected to the open source Arduino software. The designed sensor measures the postural sway of healthy people, in which the biofeedback of their gait is provided in the Virtual Reality environment. The aim of the present study is to build and validate the micro electro mechanical systems (MEMS) using the inertial sensor and Arduino to make it a wearable device. The other purpose of this thesis is to compare and analyse the accuracy of the variables chosen (COM, COP, Acceleration) of the MEMS with that of the Vicon systems to provide an accurate result for the biofeedback. Also to integrate the VR with the MEMS in order to provide a visual biofeedback to the individual. The response of the healthy adult in the Virtual environment is compared to the response of the same adult in the real environment. This biofeedback comparison is done to unearth the best response from the people to implement in a clinical study.

MeSH Words: Motion Capture, Sensor, Biofeedback, Virtual Reality.

WHY DOES DISCRIMINATION ERODE MENTAL HEALTH?

Presenter	Verma, Khyati Graduate, Psychology
Mentor	Prof. Daniel Lannin
Authors	Khyati Verma; Daniel Lannin; Luke Russell; Jeremy Kanter; Ani Yazedjian

Purpose: The present study explores associations among perceived discrimination, loneliness, self-esteem and psychological distress. Perceived discrimination-or believing one is experiencing prejudicial treatment based on membership in particular categories-is linked to experiences of psychosocial difficulties, such as low self-esteem and increases in psychological distress (Jackson et al., 1996, Clark, Coleman, & Novak, 2004, Seaton, Caldwell, & Sellers, 2010). Perception that one is discriminated against is also associated with increased feelings of isolation (Jochman, 2019; Hope, Hoggard, & Thomas 2015). It is plausible when perceived discrimination is internalized by youth, they may experience heightened sadness and unhappiness due to feeling socially isolated; such loneliness may result in increased psychological distress. Therefore, we hypothesized that loneliness would mediate associations among perceived discrimination and psychological distress and self-esteem.

Procedure: During fall 2019, 184 youth aged 14-21, participating in the Champaign Area Relationship Education for Youth (CARE4U) program, completed pretest survey data. Participants completed questionnaires assessing perceived discrimination (Sternthal, Slopen, & Williams, 2011), psychological distress (Kessler et al., 2002), self-esteem (Robins, Hendin, & Trzesniewski, 2001), and loneliness (van Roekel et al., 2018). Parent permission and child assent were taken before the administration of surveys.

Results: Hayes (2018) PROCESS analyses tested direct and indirect effects in our hypothesized models via 5,000 bias-corrected bootstrapped samples. Results indicated perceived discrimination directly predicted greater psychological distress ($\beta = .13$, $p = .04$), and the indirect effect via loneliness was also statistically significant ($\beta = .15$, $p = .001$, 95% CI = [0.06, .24]). In contrast, perceived discrimination was not a significant direct predictor of self-esteem ($\beta = -0.03$, $p = .63$), however the indirect effect via loneliness was significant ($\beta = -0.09$, $p = .004$, 95% CI [-0.18, -0.03]).

Conclusions and Implications: The present study found perceived discrimination was both directly linked to greater psychological distress for youth, and indirectly linked by feelings of loneliness. In contrast, perceived discrimination was not directly related to self-esteem; though was indirectly linked with lower self-esteem through associations with feelings of loneliness. Together, these results suggest when discrimination is internalized it may result in increased feelings of loneliness, which may erode mental health and self-esteem in youth. Though some youth experiencing discrimination may maintain their self-esteem, they may still report symptoms of distress.

GENDERED PROFESSION BIAS IN VIRTUAL WORLDS

Presenter	Walker, Kristin Graduate, Arts Technology
Mentor	Prof. Sercan Sengun
Authors	Jennifer Price; Lyndsie Schlink; Kristin Walker; Sercan Sengun

In this study, we collect and analyze data from online games to explore the reflection of gendered profession bias in virtual world design. Gendered professions emerge when gender bias or stereotypes designate a profession or a job to be only suitable for a certain gender. This type of bias can act as a gatekeeper, especially for females, to various job fields such as STEM. While in the physical world, superficial explanations can be offered for the gender divide for some jobs (e.g., the lack of female lumberjacks might be attributed to average body strength of genders, etc.), there is very little reason (physical or otherwise) for a similar gender divide to occur in a virtual world other than real-life bias permeating to design decisions. We collect and analyze data from a popular online multiplayer game (World of Warcraft) to illustrate how gendered profession bias affects the design decisions in the game and might contribute to reinforcing our real-life stereotypes.

ACADEMIC SELF-EFFICACY, LEARNED HELPLESSNESS, AND GPA AMONG WHITE AND RACIALLY MINORITIZED STUDENTS

Presenter	Wallace, Mary
	Undergraduate, Psychology
Mentor	Prof. Suejung Han
Authors	Mary Wallace; Suejung Han

Purpose: Racial disparity in academic performance has been well-documented (e.g., Oyserman & Lewis, 2017), but reasons that explain such disparity need more scholarly attention as they could be intervention targets. Among other psychological mechanisms, this study examined two socio-cognitive barriers of low self-efficacy and negative outcome expectations (Bandura, 1986). They were operationalized as low academic self-efficacy (one's conception of their ability to perform academic achievement; Gerardi, 2005) and learned helplessness (a sense of lack of control over one's actions due to perceived repeated negative outcomes; Smallheer, 2011). I hypothesized that racial membership (i.e., White vs. students of color) would be associated with GPA via differences in academic self-efficacy and learned helplessness.

Procedure: A sample of 165 college students (122 Whites, 33 students of color) participated in the online survey of this study. The mean age was 19.04 (SD=1.47). The sample included 142 females, 20 males, 1 non-binary, and 2 not reporting gender. The survey consisted of Learned Helplessness Scale (Smallheer, 2011), College Academic Self-Efficacy Scale (Owen & Froman, 1988), and GPA/demographic questions.

Results: Data collection is in progress and complete results will be reported at the conference if accepted. A preliminary one-way ANOVA using SPSS showed White students scored higher on academic self-efficacy, $F(1, 119) = 7.16, p = .008$, and GPA, $F(1, 160) = 6.42, p = .01$, than students of color, but there was no significant mean difference on learned helplessness, $F(1, 153) = .49, p = .49$. A path analysis with AMOS 22.0 revealed a marginal to adequate fit to the data, $\chi^2(1) = 2.34, p = .13, CFI = .97, RMSEA = .09, 90\% CI = .00, .25$. Racial membership was associated with GPA via academic self-efficacy (racial membership-academic self-efficacy path $\beta = .21, p = .013$, academic self-efficacy-GPA path $\beta = .41, p < .001$), but not via learned helplessness (racial membership-learned helplessness path $\beta = .06, p = .47$, learned helplessness-GPA path $\beta = -.09, p = .28$). Correlation coefficients between learned helplessness and GPA were $r = -.29 (p = .03)$ among Whites and $r = -.33 (p = .06)$ among students of color, but they were not significantly different from each other ($z = -.7, p = .24$).

Conclusions and Implications: Acknowledging and educating that racial disparities in academic performance is due to differences in confidence rather than actual competence, may help racially minoritized students boost their academic self-efficacy. Further analyses with a larger sample of racial minority students will re-examine the role of learned helplessness, particularly among different subgroups of racially minoritized

INVESTIGATING PARASITOID WASP VENOM AS A TOOL FOR TARGETED AB DEGRADATION

Presenter	Waring, Ashley Graduate, Biological Sciences
Mentor	Prof. Nathan Mortimer
Authors	Ashley Waring; Emma Hartness; Nathan Mortimer

Alzheimer's Disease (AD) is a neurodegenerative disease that leads to loss of cognitive function and dementia. At the molecular level, AD pathogenesis is due to the formation of β -amyloid plaques and neurofibrillary tangles. These β -amyloid plaques form as a result of the aggregation of amyloid β (A β) peptides. The accumulation of A β contributes to AD progression, and thus, the clearance mechanisms that prevent A β accumulation and subsequent aggregation are essential for preventing AD progression. The protease Neprilysin (NEP) is responsible for cleaving a variety of peptide substrates and has been shown to regulate A β clearance via peptide degradation. Recent findings have shown A β activity in the *Drosophila* innate immune response to parasitoid wasp infection as well as conservation of the NEP protein in wasp venom. Wasp venom proteins frequently have highly specific effects on host immunity, so we predict that these NEP-like venom proteins may target host A β during infection. Preliminary data show that expression of human A β in fly larvae results in an infection-induced autoinflammatory response, and that this response is blocked in flies that are infected by the virulent wasp species *Leptopilina boulardi* or *Ganaspis sp.1*. This suggests that the virulence mechanisms of these wasp species may specifically target A β .

COMPARING IN-SITU NITRATE AND CHLORIDE TRENDS WITHIN STREAM BANKS DURING STORM EVENTS

Presenter	Wassik, Jack Graduate, Geography, Geology, and the Environment
Mentor	Prof. Eric Peterson
Author	Jack Wassik

Accumulating nitrate levels threaten to deteriorate aquatic and ecological health and quality. Nitrate can be removed by microbial denitrification and plant uptake but is dependent on its transport from the stream into the hyporheic zone, stream banks, and groundwater. Under base flow, the groundwater gradient prevents significant amounts of infiltration and nitrate transport, preventing nitrate removal. During storm events, stream stage alters hydraulic head, increasing infiltration, but the amount and rate of nitrate transport during these events is unknown. This study will compare the transport of nitrate to chloride from the stream into the hyporheic zone, banks, and groundwater during storm events using wells across a low-gradient stream. Due to chlorides conservative nature, any differences to nitrate transport that we measure, either in timing or amplitude of change, can be inferred as potential uptake or denitrification occurring.

MACHINE LEARNING TO PREDICT ATOMIC COLLISION CROSS SECTIONS

Presenter	Wilkinson, Bailey Undergraduate, Physics
Mentor	Prof. Allison Harris
Authors	Bailey Wilkinson; Allison Harris

Atomic collisions are widely used in many applications, but there are significant challenges to producing the complete data sets needed for these applications. Sophisticated computational models can require long runtimes and high performance computing resources, while detailed experimental measurements can be difficult to achieve. This makes both computational and experimental data financially prohibitive. Our goal is to determine if machine learning can provide the needed data with less resources. We use the TensorFlow software package to predict excitation cross sections using an artificial neural network. We use the trained network to predict cross sections beyond the currently available data sets.

MULTIPOLAR DECOMPOSITION OF OPTICAL SPECTRA OF HIGH-INDEX DIELECTRIC NANOPARTICLES

Presenter	Wilkinson, Bailey Undergraduate, Physics
Mentor	Prof. Uttam Manna

Resonant excitation of high-index dielectric nanostructures provide great opportunities for engineering novel optical phenomena and applications. However, difficulties often arise when interpreting the observed spectra because of the overlap of the broad resonances contributed by many factors such as particle size, shape, and background index. In this presentation, I will show the results of decomposition of multipolar resonances associated with electric and magnetic modes in silicon nanospheres for different diameters calculated using Finite Difference Time Domain (FDTD) method.

COLONIZATION OF CORE BENEFICIAL BEE GUT MICROBIOTA ACROSS SPECIES

Presenter	Williams, Mikey Undergraduate, Biological Sciences
Mentor	Prof. Benjamin Sadd
Authors	Mikey Williams; Logan Sauers; Ben Sadd

Hosts harbor complex microbial communities responsible for aiding the host in aspects of development, digestion, and defense. The intricate relationships developed between hosts and their microbiota lead to evolutionary dynamics which are likely to influence the colonization and function of these microbes. Previous work in social bees show that *Snodgrassella alvi* exhibits specificity at a genus level, and that colonization is determined by an interaction between host and microbe genotypes. Thus, this research aims to investigate whether specificity exists at the species level. Bees from germ-free hosts of *Bombus impatiens* and *Bombus griseocollis* were inoculated with strains isolated from several bumble bee species. We find additional support for a genotype by genotype interaction driving the colonization in this system. Additionally, we find only weak evidence for species level specificity, likely driven by *S. alvi* strains better colonizing their native *Bombus griseocollis* hosts. Interestingly, we find no evidence for genus level specificity as demonstrated in other previous work. These findings suggest that there may be more at play in the colonization of this core beneficial microbe than previously thought.

SYNTHESIS AND DEVELOPMENT OF PHENOXY SULFINATE ESTERS AS TOOLS FOR THE SYNTHESIS OF CHIRAL SULFINAMIDES

Presenter

Witte, Jordan

Undergraduate, Chemistry

Mentor

Prof. Shawn Hitchcock

Ellman's sulfinamide (enantiomerically enriched tert-butylsulfinamide) has been at the forefront of much of the chemistry of the chiral sulfinamides due to its versatility in the synthesis of chiral amines, beta-amino alcohols, and amino acids among other compounds. The Ellman auxiliary is used primarily as a stoichiometric agent for diastereoselective reactions, but there is an increasing use of such compounds as chiral organocatalysts in enantioselective reactions such as reduction, epoxide opening, and the Strecker synthesis. Chiral sulfinamides are often prepared from sulfinyl chlorides with a chiral agent that promotes dynamic kinetic resolution for the isolation of diastereomerically pure sulfinate esters. Our research program is focused on developing alternate routes to these compounds via either mixed anhydride approaches or carbodiimide approaches. Ultimately, we are interested in developing these routes as asymmetric preparative methods for sulfinamides for use in the process of asymmetric opening of meso-epoxides. This poster will describe our initial efforts to prepare a series of phenoxy sulfinate esters bearing different substituents that will allow the probing of impact of structural and electronic properties on the process of dynamic kinetic resolution. Ultimately, we are interested in developing phenoxy sulfinate esters as more easily prepared and more stable surrogates for sulfinyl chlorides. The poster will discuss our efforts to refine the coupling method for the preparation of phenoxy sulfinate esters and their use in the process of dynamic kinetic resolution.

MARS GENE IMPACTS SENSORY NEURONS IN CHARCOT-MARIE-TOOTH DISEASE

Presenter

Wright, William

Undergraduate, Biological Sciences

Mentor

Prof. Alysia Vrailas-Mortimer

Charcot-Marie-Tooth disease (CMT) is a heritable neurodegenerative disease that affects 1 in every 2,500 people in the United States. CMT can be caused by mutations in the MARS gene and results in loss of sensation and nerve damage that progresses up the limbs over time. This impacts the ability to move around normally as leg nerves that lose sensation make walking difficult to impossible as well as losing most fine motor skills. While most research into CMT has focused on motor neurons, little is known about the role of MARS in sensory neurons. To study the role of how the loss of MARS in sensory neurons affects locomotor functions, I use the fruit fly *Drosophila melanogaster* because the MARS gene is conserved between humans and fruit flies, the nervous system is organized similarly with less complexity, and gene manipulation is fast and simple. I performed locomotor assays to collect data on sensory neuron linked behaviors using different RNAi lines to inhibit MARS expression in sensory neurons. I find that inhibition of MARS in the sensory neurons results in disrupted locomotor behaviors, which mimic Charcot-Marie-Tooth disease.

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE APPLIED TO ACOUSTICS

Presenter	Yost, Jack Undergraduate, Physics
Mentors	Prof. Xing Fang, Q. Charles Su, Rainer Grobe
Authors	Jack Yost; Xing Fang; Q. Charles Su; Rainer Grobe

Neural Networks have a wide variety of applications in modern computing and one of these applications is the ability to effectively distinguish between different voices. Using data obtained from the Wolfram Data Repository, we are able to develop and train a simple network capable of not only distinguishing but identifying human voices by recognizing acoustic characteristics beyond even the capabilities of the human ear. We will discuss how the computer is able to read information from data files with the help of different mathematical operations and how the computer uses that information to correctly identify different vocal patterns. We will also be discussing the structure of our network and just how simple it is to reproduce

THE CRISIS OF DEMOCRACY: THE CASE STUDY OF DEMOCRATIC BACKSLIDING AND THE RISE OF POPULISM IN POLAND

Presenter

Yusupova, Nargiza

Graduate, Politics and Government

Mentor

Prof. Ali Riaz

The Crisis of Democracy: The Case Study of Democratic Backsliding and the Rise of Populism in Poland Since 2015 the year the Law and Justice (PiS) party won both presidential and parliamentary elections, dramatic changes occurred in Polish constitutional politics. These changes threatened the independence of the Tribunal as well as put constraints on the independence of the media, civil service, police and prosecution laws. Following changes in the constitution many academic scholars, politicians, NGOs, democracy activists, including the European Commission condemned the Law and Justice Party's (PiS) move calling it as an act to dismantle institutional checks on the government and erode civil and political rights.

In Poland there are warning signs of an important deterioration in democratic qualities already attained during democratization period. As an example, changes and amendments introduced in Constitutional Tribunal, judiciary, and the new Police Act law will be discussed in depth in the research. Additionally, many political science scholars insist that the tactics utilized by PiS party during and after elections resembled of those political leaders' strategies who show signs of populism.

With these political developments in mind, this research aims to provide an overview of the democratization in Poland, the progress it made during transition. I intend to explore how and why Polish democracy is backsliding. The principal objective of this thesis is twofold: first, it strives to combine theoretical analysis of democratic erosion with the case study of Poland. Second objective of this thesis is to offer an alternative framework of analysis for understanding democratic backsliding by looking at populism as a possible contributory factor to the phenomena. Reference to backsliding and populism in Poland in same breath is not meant to presume that rise of populism is a contributory factor to democratic recession in other countries. Rather, the case study of Poland is expected to contribute to the literature of understanding democratic recession and identify factors contributing to the backsliding.

KEYWORDS: Democracy, Poland, Populism, democratization, discourse, backsliding.

THE ROLE OF TRMS IN PREPROPHASE BAND FORMATION AND CELL DIVISION ORIENTATION

Presenter	Zare`-Mehrjerdi, Omid Graduate, Biological Sciences
Mentor	Prof. Viktor Kirik
Authors	Omid Zare`-Mehrjerdi; Christy Fornero; Jackson Dunn; Viktor Kirik

In plants, the position of each cell is fixed by its cell wall. Because cell migration is not possible, plants must carefully control the orientation of cell division to ensure proper organ and tissue development. Just before prophase, the division plane is marked by the formation of the preprophase band (PPB). The PPB is an ordered array of microtubules that encircles the nucleus and runs transverse to the axis of growth. The endoplasmic reticulum (ER) reorganizes into a ring structure that associates with the PPB. At the onset of prometaphase, the PPB is disassembled. During cytokinesis, the cell plate localizes to the division plane identified by the PPB. The cell plate expands laterally and is guided to the former location of the PPB where it attaches to the cell wall. The mechanism by which the cell plate is guided to the PPB is not understood. It has been suggested that proteins including Tonneau 1 (TON1), Tonneau 2 (TON2), and the Tonneau 1 Recruiting Motif (TRM) family may be involved in the regulation of cell division orientation and PPB formation. Plants with mutations in the TON1 or TON2 genes fail to form a PPB and show aberrant cell division. TRMs are capable of binding directly to TON1 and some contain a region (the M3 motif) that is likely responsible for interaction with TON2. It is possible that one or more TRMs form a complex with TON1 and TON2 and may be involved in intracellular targeting. A subset of TRMs containing the M3 motif (TRMs 12, 13, 14, 15, and 18) are homologous with the P-subunit of phosphatidyl inositol n-acetylglucosaminyltransferase (PIG-P). TRM18 has been shown to localize to the ER in previous studies. An additional TRM (TRM33) shows homology with PIG-P but lacks the M3 motif. In an attempt to identify the possible function of these proteins, knockout and overexpression lines will be analyzed. Due to their homology, it is possible TRMs are functionally redundant. To test this, multiple-knockout lines will be created. Changes in localization of the TRMs or TON2 will be evaluated.

ASSESSING TOXICITY OF LEURS-I MUTANTS IN E. COLI BL21 (DE3)

Presenter	Ziegler, Logan N Undergraduate, Chemistry
Mentor	Prof. Christopher S. Weitzel
Authors	Logan N. Ziegler; Kristen K. Eilts; Christopher S. Weitzel

Sulfolobus islandicus contains a duplication of leucyl-tRNA synthetase (LeuRS). These paralogs are referred to as LeuRS-F and LeuRS-I. LeuRS-F is known to be the canonical LeuRS for *S. islandicus*; however, the function of LeuRS-I is currently unknown. Past results have shown that LeuRS-I is toxic to *Escherichia coli*. We postulate that the enzymatic activity of LeuRS-I negatively influences the fitness of this model organism by promoting errors in protein synthesis by mischarging cognate leucine onto non-cognate tRNA substrates. In an attempt to determine the root cause of this toxicity, catalytic mutants of this paralog were assayed for their effects on the viability of an over expressor strain of *E. coli* referred to as BL21(DE3). Experimental conditions tested for the plating assays included altering both the leucine content and inducer (IPTG) concentration within lysogeny broth (LB) solid supports. We speculate that increasing the leucine content will promote mischarging of the noncanonical tRNA substrates, while increasing IPTG concentrations will lead to the generation of more protein, both promoting the toxicity of wild-type LeuRS-I. Preliminary results assaying wild-type LeuRS paralogs alongside LeuRS-I mutants will be presented.

2020 Symposium

Group Abstracts – Afternoon Session

PARENTAL PROBLEM DRINKING AND ADOLESCENT SUBSTANCE USE: THE MODERATING ROLE OF SIBLING RELATIONSHIPS

Group Leader	Adams, Ashley Graduate, Psychology
Group Members	Sara Kurbyun, Undergraduate, Psychology
Mentor	Prof. Laura Finan
Authorship	Sara Kurbyun; Ashley Adams; Daniela Pancrazio-Diez; Alexis Parrish; Laura Finan; Christine Ohannessian

Families are complex systems with each member influencing all others (Cox & Paley, 1997). Family factors like parental problem drinking have been consistently shown to predict a range of adverse adolescent adjustment outcomes, including alcohol and other substance use (Caspi et al., 2018; Park & Schepp, 2014). However, other family factors, such as sibling relationships, may serve as protective or additive risk factors in influencing adolescent behavior. Limited extant research has investigated the role of sibling relationship characteristics in the context of parental problem drinking (Rueter et al., 2015). Therefore, the current study examined if hostility and warmth in sibling relationships served as risk or protective factors in the relationship between maternal and paternal problem drinking and adolescents' alcohol and drug use.

Data were drawn from the Adolescent Adjustment Project (Ohannessian, 2009), which surveyed adolescents from seven Mid-Atlantic State public high schools in Spring 2007 (Mage=16.08; SD=.69; 55% female). Only adolescents who reported having a single sibling were included (N=373). Adolescents were asked how often in the last 6 months they (a) used marijuana, sedatives, stimulants, inhalants, hallucinogens, cocaine or crack, and opiates (drug use frequency) and (b) how much and how often they drank beer, wine, and liquor (alcohol use quantity and frequency). The Short Michigan Alcoholism Screening Test (Crews & Sher, 1992) measured adolescents' perceptions of their mother's and father's alcohol use problems. Scale items were summed such that greater scores represented greater maternal (MPD; $\alpha=.60$) and paternal (PPD; $\alpha=.84$) problem drinking. Finally, the Sibling Relationship Questionnaire (Slomkowski et al., 2001) was used to assess adolescents' perceptions of warmth ($\alpha=.89$) and hostility ($\alpha=.87$) with their sibling.

Regression analyses were used to examine associations between sibling relationship characteristics, parental problem drinking, and adolescents' substance use. Separate models were conducted for MPD and PPD, and structural elements of sibling relationships were controlled (Table 1). Only PPD was positively associated with adolescents' alcohol use (Model-2). However, sibling hostility and MPD (Model-3) and sibling hostility and PPD (Model-4) were positively associated with drug use. Further, sibling hostility and PPD interacted to predict drug use ($B=.14, p<.05$). Probing this interaction with simple slope analyses indicated that adolescents in families with high PPD and high sibling hostility reported the greatest drug use. Results may help identify youth that are at the greatest risk for engaging in health risk behaviors and can support substance use treatment efforts for adolescents by addressing family functioning and relationships.

LONGITUDINAL ASSOCIATIONS BETWEEN SCHOOL CONNECTEDNESS AND ADJUSTMENT PROBLEMS DURING ADOLESCENCE

Group Leader	Adams, Ashley Graduate, Psychology
Group Members	Victoria Powers, Undergraduate, Psychology; Jake Solka, Undergraduate, Psychology
Mentor	Prof. Laura Finan
Authorship	Ashley Adams; Victoria Powers; Yessenia Chavez; Jake Solka; Laura Finan; Christine Ohannessian

Given that adolescents spend majority of their lives in school, nearly seven hours every day, it is crucial to investigate how their relationship with their school impacts developmental outcomes. Key features of school connectedness, such as support and acceptance from the community, serve as protective factors against development of depression and anxiety symptoms during adolescence (Waters et al., 2009; Joyce & Early, 2014). Further, longitudinal research suggests that school connectedness is negatively correlated with behavioral problems and psychopathology during the adolescent period (Lester et al., 2013; Loukas et al., 2009). Although these relationships have been established, extant research has yet to investigate potential developmental pathways among these constructs. Therefore, the current study sought to examine depressive and anxiety symptoms as mediators of the relationship between school connectedness and later problem behavior.

Data were drawn from the Predictors of Anxiety and Depression During Adolescence (PANDA) Project (Ohannessian & Vannucci, 2018), which surveyed adolescents from five Northeastern State middle schools in fall 2016 (T1; $M=12.75$; $SD=.71$; 51% female), spring 2017 (T2), and fall 2017 (T3). Adolescents reported on depressive and social anxiety symptoms, feeling of school connectedness, and problem behaviors. The Center for Epidemiological Studies Depression Scale for Children (Weissman et al., 1980) was used to measure adolescent depressive symptoms ($\alpha T1=.91$); the Screen for Child Anxiety Related Emotional Disorders (Birmaher et al., 1999) was used to assess social anxiety ($\alpha T1=.87$); and a school connectedness scale measured school connectedness ($\alpha T1=.71$). Adolescent also reported on the frequency in which they engaged in a variety of risk behaviors (e.g., start physical fights; $\alpha T1=.95$) (American Psychiatric Association, 2013).

Structural equation modeling was used to examine whether depressive and anxiety symptoms (T2) mediated the relationship between school connectedness (T1) and later problem behavior (T3). Age, gender, and previous time points of all endogenous variables were controlled (Figure 1). Model results indicated that school connectedness negatively predicted later depressive and anxiety symptoms. However, only depressive symptoms in turn positively predicted later problem behavior. The direct effect of school connectedness to problem behavior 1.5 years later remained significant after accounting for the mediated pathways, suggesting that depressive symptoms partially mediated this effect.

These findings highlight a developmental pathway from school connectedness to later problem behavior through adolescents' depressive symptoms. Findings may aid schools in identifying at-risk youth for developing later emotional and behavioral problems and point to the importance of promoting school connectedness among young

IDENTIFYING, ANALYZING, AND ASSESSING THE LOCAL POLITICAL CLIMATE THROUGH TWEETS

Group Leader	Ainslie, AJ Undergraduate, Communication
Group Members	Amina Jinadu, Undergraduate, Communication; Marineth Sierra, Graduate, Communication; Donovyn Valdez, Undergraduate, Communication
Mentor	Prof. Nathan Carpenter
Authorship	AJ Ainslie; Amina Jinadu; Marineth Sierra; Donovyn Valdez

The 2016 presidential election saw major changes in the way politics are discussed on social media platforms, specifically Twitter. The Twittersphere has become the go-to spot for political conversation and news, but the conversation may not always be civil. With political leaders using Twitter in an official capacity, and the general public able to retweet their info while adding their own opinion, Twitter is a great place to study that conversation on a more local scale to see just what is happening in our own virtual backyards.

We collected Twitter data from publicly accessible accounts geo-located in the larger McLean County region, dating back to 2016, using a Python wrapper for Twitter's public API. After tweet collection, we ran the data through a keyword filter of our own creation to gauge what, who, and how political issues are being discussed. Next, we examined the content of the tweets through sentiment analysis in order to gauge the emotional categories and polarity of the overall political conversation. Finally, we used Gephi, a social network analysis tool, to map the extent to which McLean County Twitter users were engaged in conversation with each other residents of McLean County.

After running these analyses, we hope to answer the following questions: has the Twittersphere become more negative when it comes to discussing politics? Where do Twitter users in McLean County fall in terms of the political spectrum? How has the local political conversation changed over time on Twitter? How does local political discourse compare with national trends?

We anticipate this study to help us better understand the extent to which online political discourse has changed in McLean County, IL, and the extent to which local changes are reflected in national trends. We hope that it might serve as a model for future studies in other local areas.

REACTIVE OXYGEN (ROS) AND REACTIVE NITROGEN SPECIES (RNS) DETECTION IN AXENIC C6 GLIOMA CELLS: ASSESSMENT OF THE ROLE OF ELECTRICAL STIMULATION

Group Leader	Apuzzo, Christopher Undergraduate, Chemistry
Group Members	David Platt, Graduate, Chemistry
Mentor	Prof. Marjorie Jones
Authorship	Christopher Apuzzo; David Platt; John Rink; David Cedeno; Ricardo Vallejo; Marjorie Jones

Chronic neuropathic pain is a common debilitating affliction with a myriad of causes and treatments. Clinical evidence indicates that the application of electrical stimulation (ES) to neural tissue provides efficacious pain relief, although molecular mechanisms by which the therapeutic effects arise are not fully understood and in need of description. A contributing factor to the development and maintenance of chronic neuropathic pain can be ascribed to oxidative stress processes mediated by astrocytes in the nervous system. It is hypothesized that this particular population of glia plays its role in neuropathic pain via production of reactive oxygen species (ROS) and reactive nitrogen species (RNS). Development of a model cell system through which radical species can be reproducibly measured is necessary to understand how astroglia produce ROS/RNS in response to ES and other environmental conditions. Incubation of C6 glioma cells with a fluorescent probe for superoxide or nitric oxide has proven useful in assessing these intracellular species in response to chemical perturbates, such as the gliotransmitters glutamate and adenosine. Preliminary data support that some gliotransmitters influence superoxide and nitric oxide production. Pending work includes obtaining subsequent reproducible, quantitative measures via a fluorometer for both superoxide and nitric oxide to compare relative changes between these reactive radical species in experimental environments. Future work includes the use of a calcium probe to query the relations between calcium mobilization and these reactive radical species.

PRESENCE OF ANIMALS RESPONSIBLE FOR HIGH TURBIDITY LEVELS IN A LOCAL STREAM

Group Leader	Archie, Shira Undergraduate, Biological Sciences
Group Members	Devin Whitworth, Undergraduate, Biological Sciences
Mentor	Prof. Catherine O'Reilly
Authorship	Shira Archie; Devin Whitworth; Catherine O'Reilly

Understanding water quality can benefit society as a whole. Specifically, understanding turbidity, the measure of sediment in the water. Turbidity levels in local streams affect the water quality of many communities surrounding it. If the water becomes too turbid (less clear), available high quality drinking water could become compromised for animals and humans using these streams. We conducted our research on Six Mile Creek located in Hudson, IL that connects to Lake Evergreen, the drinking water reservoir.

We collected water samples from a local stream and fluctuations in the water turbidity levels made us question what could be causing such random spikes. The major assumption was that animals possibly using the stream could be responsible for them, considering they might use the stream as a corridor to migrate around.

We addressed the following questions: (1) Do animals use the stream as a corridor (2) How much does turbidity vary? (3) Do terrestrial animals increase turbidity levels?

To see if animals are causing the turbidity levels to increase, we decided to test the water at different times, and set up cameras that would take pictures if an animal was present. With the data we collected from both tests, we can compare the times to see if animals are present at the times of high turbidity.

Based on trends, the normal water turbidity levels is around 10 NTU. However, when the levels spike, the turbidity levels can rise up to 40 NTU. Preliminary evidence suggests that these spikes happen daily in the stream we are testing. However, seasonal averages for turbidity levels varied. In fall, the average stabilized at about 10 NTU, while in spring the average was the highest of all seasons ranging at about 20-25 NTU. The lowest average turbidity, was in summer with an average of about 8 NTU. Our photos also captured several animals in or around the stream on occasion. The types of animals consisted of raccoons, deer, and other small terrestrial animals.

The known presence of terrestrial animals that are using the stream as a corridor could be responsible for the high levels of turbidity in the water.

INVESTIGATING HOW IMAGE ANGLE INFLUENCES PERCEPTIONS OF THE TARGET

Group Leader	Bajaczyk, Amy Undergraduate, Psychology
Group Member	Christopher Atkinson, Graduate, Psychology
Mentor	Prof. Eric Wesselmann

Theorists from film, television, and comics studies argue that image angle can influence how viewers perceive the image subject; a high angle (looking down on the target) is supposed to make that target appear small and weak, whereas a low angle (looking up at the target) is supposed to make that target appear powerful. An eye-level image generally is considered neutral. Previous studies have found that low angles can make individuals appear more powerful than the other two angles. These studies have had mixed results on ratings of general attractiveness and likability. Further, these studies have examined image angle within the context of a broader story or series of images (e.g., film clips). We examined the basic general argument about image angles in a minimal situation: one still image unaccompanied by context.

College undergraduates (N=127) participated in the study online. We randomly assigned participants to view either a low angle (n=42), high angle (n=42), or eye-level (control; n=43) image of a male confederate. Participants viewed the image and rated the confederate on items assessing how generally powerful (3 items: powerful, strong, capable; Cronbach's $\alpha=.80$), attractive, and likeable they found him. Each item was on a 7-point rating scale.

Image angle had a marginally significant effect on ratings of the target's perceived power, $p=.092$, partial $\eta^2=.04$. The pattern of means suggest the main difference is between the high angle (M=3.76, SD=1.13) and control (M=4.30, SD=.89) conditions. Unexpectedly, the low angle image was descriptively lower (M=4.14, SD=1.40) than the control condition. There were no effects of image angle on ratings of attractiveness ($p=.421$, partial $\eta^2=.01$) or likability ($p=.518$, partial $\eta^2=.01$).

These data provide mixed evidence for the effect of image angle on ratings of the subject. For power, the effect only reached marginal statistical significance, and the effect size fell between small and medium heuristic range. Descriptively, the data patterns support the previous theory and research on how high angles influence perceived power, but not the effect of low angles on power. We are currently replicating this study by collecting a new sample based on an a priori power analysis using the extant effect size as a guide. We will present both the current data and the replication in our presentation.

PRIMED KNOWLEDGE ON ADHD SYMPTOMS INCREASE NUMBER OF REPORTED ADHD SYMPTOMS

Group Leader	Barrins, Sydnee Undergraduate, Psychology
Group Member	Elizabeth Marsh, Undergraduate, Psychology
Mentor	Prof. Suejung Han

Purpose Health care providers face unique challenges in diagnosing adult patients with attention-deficit/hyperactivity disorder (ADHD) (Adler et al., 2009), such as the concern for over reporting of the ADHD symptoms among college students (Nelson & Lovett, 2019). This over reporting and resulting unnecessary medications can lead to negative consequences (Courrégé et al., 2019) such obsessive-compulsive behaviors, psychotic episodes, liver failure, stroke, and cardiac arrest (Graham & Coghill, 2008). One possible reason for over reporting could be the public availability of information about ADHD symptoms. This may prime individuals, consciously or non-consciously, leading to over reporting or exaggerating symptoms. Thus, this study examined the impact of such priming on potential over reporting of ADHD. I hypothesized that students who were exposed to knowledge about ADHD would report a higher number of ADHD symptoms compared to those who were exposed to irrelevant knowledge (i.e., vegetarianism). Procedure A sample of 157 college students (18 males, 139 females, mean age = 19.10) participated in this online survey study. The randomly assigned experimental group read a one-page passage on ADHD symptoms, whereas the control group read one on vegetarianism. The passages were followed by three questions designed for manipulation check, Adult ADHD self-report scale items (Adler et al., 2006) and demographic questions. Results The data collection is in progress and complete results will be presented at the conference if accepted. A preliminary one-way ANOVA using SPSS with the ADHD vs. Vegetarianism reading conditions as the independent variable and ADHD symptoms scores as the dependent variable did not reveal a significant group mean difference, $F(1, 152)=2.00, p=0.16$. A supplementary analysis with women only, however, revealed that the ADHD reading group scored higher on the ADHD report scale than the control group, $F(1, 134)=4.30, p=.04$. Conclusion: The hypothesis was supported only among women. It is possible that women are more likely to be influenced by information presented to them (Eagly, 1983); however, complete analyses with a larger sample will clarify the meaning of the gender difference observed in the preliminary analysis. The findings that follow from this study provide more compelling evidence that research is needed in the validity of self-reporting from clients, especially in the domain of ADHD, particularly given its rapidly increased prevalence and health consequences of ADHD medications for those who do not have it.

ILLINOIS STATE UNIVERSITY LANGUAGE AND CULTURE (FROM 2012 - 2019)

Group Leader	Bartlett, Grace Undergraduate, History
Group Members	Lauren Sexauer, Undergraduate, History; Rachel Adams, Undergraduate, History; Sara Koziol, Undergraduate, History
Mentor	Prof. Agbenyega Adedze
Authorship	Rachel Adams; Grace Bartlett; Sara Koziol; Lauren Sexauer

By studying the language of a culture one can learn the important held ideologies, places of location, and how people within the culture interact with one another. Through analysis of current language used on Illinois State University (ISU) campus and a previous dictionary of ISU language created in 2012; an updated dictionary containing words that were unique to ISU was created in 2019. The campus and surrounding area of Illinois State University constitutes a rich culture-one that is created by the vast amount of people that inhabit and coexist within the environment. Moreover, in addition to ISU's culture being influenced by the people that coalesce at the university, social media and the internet also affect the general culture in this day and age. The ISU culture is a blended culture that welcomes students, professors, and individuals not only from across the Midwest but across the globe. International, as well as out of state students and professors, each bring their own unique vocabulary to ISU; the ever-rising influx of people to the campus means the ISU vernacular is always changing. Due to the changing human and online presence on the ISU campus from the seven-year gap since the first creation of the Illinois State Dictionary in 2012, our group felt it was necessary to update the dictionary. Looking back at the 2012 dictionary, our group noticed that a handful of words had fallen out of common speech for a number of different reasons. Some words found in the prior dictionary sounded dated, are now seen as slurs or offensive terms, or are no longer relevant in pop culture, thus making them irrelevant to ISU culture. Notably, in this 2019 dictionary words that stem from technology, gaming culture, social media, memes, and the internet at large were added. These types of words were missing from the 2012 dictionary most likely because internet and technological culture were not as developed or mainstream as they are now. With this updated dictionary, we hoped to provide a general understanding of what language students, faculty and staff encounter on Illinois State University's campus in 2019.

IMPACT OF ART EDUCATION ON SOCIAL-EMOTIONAL RELATIONS IN PRESCHOOLERS

Group Leader	Bove, Rebecca Graduate, Psychology
Group Members	Ashley Adams, Graduate, Psychology; Taylor Ullrich, Undergraduate, Psychology; Cristal Roman, Undergraduate, Psychology; Audrey McNamara, Undergraduate, Psychology
Mentor	Prof. Julie Campbell
Authorship	Ashley Adams; Rebecca Bove; Taylor Ullrich; Cristal Roman; Audrey Mcnamara

Evidence from previous research has shown that art programs do promote development over time, but the argument for causal relationships has not been established (Brown, Benedett, & Armistead, 2010). Social-emotional skills developed during preschool have been shown to be predictive of children's academic success later (Berk, 2019). Literature has been limited because of small sample sizes and cross-sectional methods. To promote awareness of the value of art programming, researchers at Illinois Art Station, an affiliate of Illinois State University, designed a longitudinal study to track children's social-emotional development over the course of a 12-week art program. Does involvement in 12-week art classes impact social-emotional relations? Another goal of this study is to use research to shape the success of future art programs.

Participants are preschoolers in local elementary schools who are enrolled in a 12-week art program (N = 310). During each weekly 30-minute class, an instructor guides the students through a project. Social-emotional behaviors involving peer and teacher social interactions are live coded using an app (adapted from Newton-Fisher, 2012). Peer interactions include working together, working alone, conflict, conflict alone, and helping. Teacher interactions include non-compliance, focused attention, positive engagement, and guided instruction. Every art class has up to 55 preschoolers per class. Each researcher is assigned to code up to 13 children's behaviors in one-minute intervals during the class. At the conclusion of the class, pictures of the participants' artwork are taken and assessed using a modified version of the FEATS (formal elements art therapy scale).

Our IRB has been approved and we are currently collecting data. We will calculate the FEATS for each child's completed piece of art after each lesson to quantify changes in art ability. We will also calculate individual scores for interaction of peers and teachers to track progression throughout the art program, which will provide us with a continuous variable for peer and teacher social-emotional development across the 12-week session. We will conduct a multiple regression to predict the modified FEATS based on peer and teacher social-emotional relations.

It is expected that the modified FEATS will be impacted by the peer and teacher social-emotional scores. The implications of this study are that, preschool art scores are improved as a result of improved social-emotional relations with peers and teachers. Future art programs for elementary education should consider these results.

THE DEVELOPMENT OF CARDINAL, ORDINAL, AND SPATIAL LANGUAGE IN YOUNG CHILDREN

Group Leader	Bove, Rebecca Graduate, Psychology
Group Members	Michaela Pierson, Undergraduate, Psychology; Abbey Warwick, Undergraduate, Psychology; Jazmin Lozada, Undergraduate, Psychology; Taiz Garcia, Undergraduate, Psychology; Lucy Okrasinski, Undergraduate, Psychology; Jackie Diaz, Undergraduate, Psychology
Mentor	Prof. Alycia Hund
Authorship	Rebecca Bove; Michaela Pierson; Abbey Warwick; Jazmin Lozada; Taiz Garcia; Lucy Okrasinski; Jackie Diaz; Jessica Rothman; Caroline Signa

Language is an important aspect of child development. When it comes to numbers, children first learn lists of numbers then give those words meaning (Slusser, Ditta, & Sarnecka, 2013). The more numbers children know, the greater their comprehension of ordinal orders (Brannon & Van de Walle, 2001). When a child is more familiar with ordinal labels, it helps with problem solving skills (Miller, Marcovitch, Boseovski, & Lewowicz, 2015). As for spatial language, it improves from 3- to 5-years (Hund, Bianchi, Winner, & Hesson-Mcinnis, 2017). Our objective was to specify the developmental trajectory of cardinal, ordinal, and spatial language comprehension and production for 3- to 5-year old children. Children were randomly assigned to either the Tell Me or Give Me condition, and all the children in either condition completed cardinal, spatial, and ordinal trials. The cardinal order can be defined as a numeric, such as one or three. The spatial order can be defined as the location of a person or object, such as front, middle, or back. The ordinal order can be defined as sequential numerical, such as first or third. In the Tell Me condition, the children were asked to tell the researcher where a randomly assigned labelled car was located (testing language production); whereas, in the Give Me condition, the children were asked to put a labelled car(s) in the garage (testing language comprehension). To date, 33 children have participated. As predicted, preliminary analyses revealed that there were significant improvements across development in cardinal, ordinal, and spatial language. In addition, the Give Me group performed higher than the Tell Me group for 4-year-olds, suggesting comprehension may be easier than production. Children were more successful with cardinal labels than with ordinal labels, with spatial labels being intermediate. Once completed, the results of this study may be helpful in academic and home settings, perhaps to increase exposure to complex language to facilitate developmental success.

GENDER BIAS IN RAISON D'ETRE OF VIDEO GAME FIGHTERS: WRITING BACKSTORIES FOR FEMALE VERSUS MALE VIDEO GAME CHARACTERS

Group Leader	Bryant, Steve Graduate, Arts Technology
Group Member	Prince Rana, Graduate, Arts Technology
Mentor	Prof. Sercan Sengun
Authorship	Prince Rana; Kristin Walker; Steve Bryant; Sercan Sengun

In this study, we collect and analyze data from four fighting video game franchises (Street Fighter, Tekken, Dead or Alive, and Mortal Kombat) to explore the difference in backstories for female versus male video game characters. Fighting video games typically have a roster of easily recognizable, flamboyant, stylish, and theatrical characters. Apart from creating their outlook, costumes, fighting moves, etc. game designers also come up with backstories for these characters that explain their motivations in becoming a part of the game world and narrative. We look at a roster of 218 characters from four franchises and qualitatively code their backstories. Our results indicate that there are stark differences between the motivations of female versus male characters that replicate and exacerbate gender stereotypes.

MOTHERS' HAND PREFERENCE DURING DYADIC PLAY EXPERIENCE WITH INFANTS

Group Leader	Caffey, Shaunta Undergraduate, Psychology
Group Member	Bailey Schejbal, Undergraduate, Psychology
Mentor	Prof. Julie Campbell
Authorship	Shaunta Caffey; Bailey Schejbal; Emily Marcinowski

Research shows an infant's hand preference is related to the mother's handedness (Michel, & Harkins 1988). During simple unimanual actions, Michel and Harkins (1988) found that mothers who had a strong left-hand preference had infants who had more left-hand use during reaching and unimanual actions than infants who had two right-handed parents or an infant who had a left-handed father. The purpose of this study is to examine the relation between mother and infant hand preference during complex play experience, extending beyond simple unimanual actions. Hand preference was observed for thirty-one mother-infant dyads during play experiences, across a one-year period. While video-recorded, mothers were asked to play with their infants for five minutes using a standard set of toys. Mothers' hand actions were coded as right, left or both, for each action depending on which hand was used in an interaction with the four objects. Actions were coded if mothers engaged in the following: object play, (mother interacted with the infant using an object), construction/deconstruction (mother connected or separated the chain link toy), non-construction (mother utilized an object as a tool). The number of actions performed with each hand were then put into the equation $(R-L)/\sqrt{R+L}$ in order to create a z-score of continuous hand preference. Infants' hand preference was recorded during a play situation in which the infant was presented with several different toys that could be constructed or combined. Results showed that across all play types and visits mothers preferred to use their right hand twice as often as they used their left hand and four times more than they used hands bimanually. More mothers are right hand dominant during play, which may result in asymmetrical play experience for infants with a burgeoning hand preference. A Pearson Correlation showed no significant relation between mother and infant handedness ($p = .08$). Our results do not agree with previous research; this disagreement may be due to an insufficient assessment of mother handedness, which does not require the use of the dominant hand, while the infant assessment was difficult and required the skill of a dominant hand.

LEARNING CONTINUOUS ACTION-EFFECT CONTINGENCIES THROUGH OBSERVATION

Group Leader	Cam, Yonca Graduate, Psychology
Group Member	Makayla Smullin, Undergraduate, Psychology
Mentor	Prof. Scott Jordan
Authorship	Yonca Cam; MaKayla Smullin; Scott Jordan

The effects of our movements become associated with the motor commands that generate those movements (Hommel et al., 2001), and later exposure to (i.e., perception of) those effects (e.g., being a passenger in a car) primes us to make those same types of movements. To date, these experiments have used discrete stimuli and discrete responses. The present experiment investigated whether or not response-effect pairings could be acquired during a continuous control task, and whether one can learn such pairings, simply by observing another person do the control task. One of the participants used the A and L key on a keyboard to keep a circle stimulus inside a rectangle for three minutes, while the other participant (i.e., Observers) observed them. Each key press produced a clearly discernible tone as long as the key was pressed. Half of the observers sat next to the controller and were able to observe the key-presses (i.e., actions) and dot movements (i.e. effects) the controller made-Full Observers. The other half had their view of the controller's hand obstructed, in the attempt to deny them access to the controller's actions-Partial Observers. All participants completed stimulus-compatibility reaction-time tasks to test whether dot movements or tones primed their actions, both before and after the control phase. Reaction times for Target-Prime pairings that were congruent with those in the control task were subtracted from those that were incongruent. These priming scores underwent a Session (i.e., pre- and post-within) by Prime Type (i.e., dot motion or tones-within) by Condition (i.e., Controllers, Full Observers, and Partial Observers-between) mixed factors ANOVA, which revealed a marginally significant Session X Condition interaction in which priming scores became larger for Controllers across sessions while the opposite occurred for both types of Observers. Contrary to Jordan and Hunsinger (2008), the finding that Full Observers performed more like Partial Observers than Controllers challenges the idea that one can learn the action effect contingencies produced by another, simply through observation. References Hommel, B., Müsseler, J., Aschersleben, G., & Prinz, W. (2001). The theory of event coding (TEC): A framework for perception and action planning. *Behavioral and brain sciences*, 24(5), 849-878. Jordan, J. S., & Hunsinger, M. (2008). Learned patterns of action-effect anticipation contribute to the spatial displacement of continuously moving stimuli. *Journal of Experimental Psychology: Human Perception and Performance*, 34(1), 113.

LATINA/O/X TRANSFER SUPPORT THEORY

Group Leader	Canedy, Blair Graduate, Educational Administration & Foundations
Group Members	Omar Gomez, Graduate, Educational Administration & Foundations; Jennifer Garcia, Graduate, Educational Administration; Janae Brown, Graduate, Educational Administration
Mentor	Prof. S. Gavin Weiser
Authorship	Omar Gomez; Jennifer Garcia; Blair Canedy; Janae Brown

The project explores how family dynamics and support influence a student to pursue a four-year degree after attending a community college. We propose a four-stage model in order to conceptualize the development of the student. We call this theory the Latina/o/x Transfer Support Theory. Moving from the first stage of "Continuando" to the final stage "La Realizacion" students develop skills in their path to success as a student and reaching full autonomy. Through review of the literature and auto ethnographic methods, we explore how family and familial responsibilities as well as systemic oppressions affect a students' path in higher education from enrolling in a community college and eventually transferring to a four-year institution.

FOSTERING COMMUNITY ENGAGEMENT SKILLS THROUGH ROLE-PLAYS FOR ADOLESCENTS WITH ASD

Group Leader	Christie, Margaret Graduate, Psychology
Group Members	Jessica Rillo, Graduate, Psychology; Carly Williamson, Graduate, Psychology; Danielle Swinford, Graduate, Psychology; Daniel Counterman, Graduate, Psychology; Kelsey Atteberry, Graduate, Psychology
Mentor	Prof. Karla Doepke
Authorship	Margaret Christie; Jessica Rillo; Carly Williamson; Danielle Swinford; Daniel Counterman; Kelsey Atteberry; Jessica Foley; Karla Doepke

Adolescents with Autism often have difficulty engaging in social skills in community-based settings. This intervention examined the effectiveness of teaching social skills in a clinical setting, providing parent training for further practice, and encouraging practicing skills with their child in the community. Results indicated successful skill attainment in the clinic and skill generalization to other settings. Implications include school psychologists' role in promoting community skills training for this population and strategies for home-school collaboration.

FORECASTING AN OPTIMIZED SOLAR PHOTO-VOLTAIC SYSTEM SIZE WITH A GIVEN LEVEL OF DEMAND AND AVAILABLE ROOF SPACE OF COMMERCIAL BUILDINGS

Group Leader

Coddington, Jason

Undergraduate, Technology

Group Member

Domonic Lange, Undergraduate, Technology

Mentor

Prof. Jin Jo

Commercial buildings consume a lot of electricity for a cheap cost with the potential to produce everything they demand. This study compares three tiers of consumption levels to available roof space of different types of commercial buildings to determine economic and technical feasibility of a solar photo-voltaic (PV) system. It takes into account the amount of roof space available to determine what size of a solar PV system could be installed to maximize energy offset while still making the system profitable. While there have been several studies using different quantitative methods to help determine the amount of energy that a commercial building uses, there has not been any to determine which usage tier would benefit best from a solar PV array. When gathering data we conducted solar site assessments on three potential locations in the Chicago-land area. We then took our data and used a solar energy performance model to analyze the technical feasibility of each location at each percentile of coverage. We also used a PV financial modeling tool to compare the price paid for electricity with and without a solar PV system and found the optimal size of system to maximize energy output while still making the system profitable. Our findings can be utilized as a replicable model for future PV development on commercial buildings.

TEMPERAMENT AND AGGRESSION IN EARLY CHILDHOOD

Group Leader	Croney, Samantha Graduate, Psychology
Group Member	Riley Cronin, Undergraduate, Psychology
Mentor	Prof. Alycia Hund
Authorship	Samantha Croney; Riley Cronin; Alycia Hund

Temperament has been associated with aggressive behaviors (Rothbart, Ahadi, & Evans, 2000); however, the nature of this relationship would benefit from more specificity. This project focused on the temperament dimensions of shyness and inhibitory control. Shyness is marked by slow, avoidant, or inhibited approaches to novel social situations or uncertainty, whereas inhibitory control is the ability to "suppress inappropriate approach responses under instructions or in novel or uncertain situations" (Rothbart, Ahadi, & Hershey, 1994, p. 29). We tested two types of aggression evident in early childhood. Proactive aggression is characterized by expecting positive outcomes from aggression and involves many aspects of social interaction, whereas reactive aggression is more automatic and less verbal. We focused on age 4 years when children are beginning to prepare for the transition to kindergarten, which could present challenges for children who are shy or who have low inhibitory control, especially if these aspects are linked to aggression. We predicted that inhibitory control would be negatively correlated with aggression, whereas shyness might be positively correlated with aggression. To date, 72 parents of 4-year-old children reported their child's temperament using the Short Version of the Children's Behavior Questionnaire Shyness and Inhibitory Control subscales (Rothbart, Ahadi, Hershey, & Fisher, 2001). Additionally, parents completed the Proactive Reactive Aggression Questionnaire (Dodge & Coie, 1987). Participants were recruited from area preschools and organizations serving children and families. As predicted, Pearson correlations indicated that there was a significant negative correlation between inhibitory control and proactive aggression, $r(70) = -.47, p < .001$. Similarly, there was a significant negative correlation between inhibitory control and reactive aggression, $r(70) = -.49, p < .001$. These findings suggest that lower inhibitory control is related to higher proactive and reactive aggression. There was not a significant correlation between shyness and proactive aggression, $r(70) = -.01, p = .963$, or between shyness and reactive aggression, $r(70) = -.01, p = .914$. Differences in temperament affect how children regulate their mood and behavior. This study provides further evidence that low inhibitory control is associated with higher levels of both proactive and reactive aggression. In contrast, no significant associations were evident for shyness and aggression. These findings help clarify the nature of relations between temperament and aggression in early childhood.

QUALITATIVE EVALUATION OF A MINDFULNESS-BASED SOCIAL AND EMOTIONAL LEARNING INTERVENTION

Group Leader	Flores, Rachel Graduate, Psychology
Group Member	Caroline Signa, Graduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Rachel Flores; Caroline Signa; Adena Meyers; Abigail Lyons

Two elementary schools participated in a yearlong mindfulness-based SEL intervention. The evaluation included a grounded theory approach to analyzing observations related to children's skill development and teachers' efforts to support this development. Findings illustrated student growth, reflected by confidence and independence in applying SEL skills, as well as teacher growth, reflected by confidence in teaching SEL concepts to children, successes in supporting individual children, and openness to feedback and resources from an SEL expert.

TRAUMA INFORMED PROGRAM FOR PROMOTING SUCCESS (TIPPS)

Group Leader	Foley, Jessica Graduate, Psychology
Group Members	Elizabeth McPherson, Undergraduate, Psychology; Julia Wenig, Undergraduate, Psychology; Sabrina Kelbe, Undergraduate, Psychology; Norah Glenzinski-Bufford, Undergraduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Jessica Foley; Adena Meyers; Julia Wenig; Sabrina Kelbe; Elizabeth McPherson; Norah Glenzinski-Bufford

The Trauma Informed Program for Promoting Success (TIPPS) is a 9-week ongoing program for middle school students. It is aimed at improving students' perceptions of school climate, emotion regulation, conflict management, and learning behaviors. Students were selected to participate in TIPPS based on elevated scores on a screening measure that was administered in the early fall. Students selected for TIPPS were then assigned to participate in the program in fall 2019 (fall program group) or spring 2020 (comparison group). Both groups were administered measures of outcomes (school climate perceptions, emotion regulation, learning behaviors, and conflict management skills) before the fall groups began and again at the end of the fall semester. In addition, Student Integrity Forms are administered following each lesson to examine students' perceptions of the program's acceptability. This poster will present results of analyses focusing on differences between the two groups on outcomes following the fall semester, as well as the role of demographic factors (age, gender, and socioeconomic status) in influencing the effectiveness of the program. We will also report differences in acceptability ratings compared across the three middle school grade levels.

STUDENTS PERCEPTIONS OF SOCIAL MEDIA INTEGRATION INTO ACADEMIA

Group Leader	Green, Alyssa Graduate, Communication
Group Member	Hillary Campos, Graduate, Communication
Mentor	Prof. John Baldwin

In today's world, nearly every app, tool, and website has a social media component to it. From sharing YouTube videos to communicating through platforms, educators could benefit from exploring the functionality of bringing technology into the classroom. Social media allow people to collaborate, communicate, and share information online in a social environment as creators of their own content through a virtual community. This study utilized focus groups in order to determine the perceptions that college students have about bringing social media into an educational setting. Focus groups allow participants to have a group conversation about a particular topic, while also identifying key ideas and challenging their thought processes with a group of their peers. This study examined responses from two focus groups, with a total number of nine participants. Results revealed three major themes to help identify if and to what extent social media should be incorporated into academia: Content of media, perceived strengths of social media, and perceived cons of social media.

EGG-LAYING VERTEBRATES AS AN INNOVATIVE APPROACH TO STUDYING HOW STEROID METABOLISM IS REGULATED EARLY IN DEVELOPMENT

Group Leader	Hamann, Miranda Undergraduate, Biological Sciences
Group Member	Rachel Eggleston, Undergraduate, Biological Sciences
Mentor	Prof. Ryan Paitz
Authorship	Miranda Hamman; Rachel Eggleston; Ryan Paitz

In egg laying vertebrates, embryonic exposure to maternal steroids in the yolk can elicit different phenotypic effects in offspring. Most of this work has been done on yolk androgens despite the fact yolk progestogens are far more abundant. Progestogens, such as progesterone, have the potential to elicit direct effects but are also interesting because of their potential to serve as precursors for the production of androgens, estrogens, or glucocorticoids. Since we have recently demonstrated that yolk progesterone is metabolized early in development, the goal of this study was to investigate the metabolic fate of various progestogens (pregnenolone, progesterone, and pregnanedione) injected into domestic chicken eggs. Do increased levels of progestogens result in the increased production of other steroids? To do this, 60 freshly laid chicken (*Gallus gallus*) eggs were injected with 50 µg of pregnenolone, progesterone, pregnanedione, or just the oil vehicle (n=15/treatment). Five eggs from each treatment were then sampled after 1, 3, or 5 days of development to quantify steroid levels in the yolk. We predicted that injections of progestogens would result in increased levels of downstream steroids. Quantification of 31 different steroids (8 progestogens, 5 androgens, 2 estrogens, and 16 glucocorticoids) was accomplished by using liquid chromatography-tandem mass spectrometry. As expected, injections of progestogens resulted in elevated levels of the injected steroid early in development (days 1 and 3). However, no downstream steroids were elevated in the progestogen treated eggs. By day 5 of development, eggs injected with pregnenolone and progesterone, but not pregnanedione, had decreased levels of several steroids (pregnenolone, progesterone, etiocholanolone, pregnanedione, and pregnanolone). This decrease in steroid levels we see in progesterone and pregnenolone may be attributed to an induction of the production of enzymes required for the metabolism of those progestogens.

FINANCIAL AND TECHNICAL FEASIBILITY STUDY OF ON-SITE PHOTOVOLTAIC GENERATION FOR GOVERNMENTAL PROPERTIES IN NORMAL, IL

Group Leader	Harvel, Nikola Undergraduate, Technology
Group Member	Josh Schapmire, Undergraduate, Technology
Mentor	Prof. Jin Jo

The Town of Normal, IL currently spends over \$650,000 annually on utilities expenditures. The Town of Normal themselves estimated that these expenditures will increase aggressively over \$150,000 by the 2023-24 fiscal year. One solution investigated in this report to help minimize these increasing costs is the use of on-site photovoltaic (PV) energy generation. While most of the electrical energy in the Midwest is sourced from non-renewable power plants, current PV technology allows for production of clean and inexhaustible energy at a price point that can be competitive with traditional fossil fuels. This paper provides an overview of solar installation potential in the Midwest, specifically Normal, IL and discusses the maximum potential to which this region can minimize energy expenditures through on-site solar PV systems on the governmental buildings. By partnering with the Office of Facilities and Energy Management in Normal, we were granted access to our proposed sites so that accurate measurements could be taken for our simulations. In addition, we were provided all the necessary information on their electrical rates, and past usage history to accurately represent savings for each proposed location. As a result, our report includes a financial review of Normal's current and projected energy expenditures, quantitative data collected through our field campaign and simulated results representing the extent to which Midwestern towns can minimize increasing energy expenditures.

QUASI-KERNELS & HAIRY TOURNAMENTS

Group Leader	Hayes-Carver, Jesse Undergraduate, Mathematics
Group Member	Walter Witt, Undergraduate, Mathematics
Mentor	Prof. Songling Shan

Jesse Hayes-Carver & Walter Witt
MAT 268 - Undergraduate Research

Let $D = (V, A)$ be a digraph. A vertex set $K \subseteq V$ is a quasi-kernel of D if K is an independent set in D and for every vertex $v \in V \setminus K$, v is at most distance 2 from K . P.L. Erdős and L. A. Székely in 1976 conjectured that if every vertex of D has a positive indegree, then D has a quasi-kernel of size at most $|V|/2$. A tournament is obtained from a complete graph by assigning a direction to each edge, and a hairy tournament is a digraph whose deletion of all sink vertices gives a tournament, where a sink vertex is a vertex of zero out-degree. In this work, we study the size of a quasi-kernel in a hairy tournament and verify the Erdős-Székely Conjecture for hairy tournaments.

RECYCLING OF SINGLE-STREAM WASTE GLASS IN MORTAR

Group Leader	Hu, Xi Graduate, Technology
Group Member	Jacob Harlow, Undergraduate, Technology
Mentor	Prof. Pranshoo Solanki
Authorship	Xi Hu; Jacob Harlow; Pranshoo Solanki

Glass, as a byproduct of various municipal recycling programs, financially causes a significant burden by collecting it from the local single-stream recycling system with a low reuse level of mixed glass. According to the United States Environment Protection Agency (USEPA, 2018) report, 11.5 million tons of glass was generated in the United States in 2015. This waste glass represents 4.4% of all Municipal Solid Waste (MSW) in the United States. The total amount of glass recycled in 2015 was 3 million tons which is 26.4% of all the glass generated. Landfills received 7 million tons of MSW glass which accounts for 5.1% of all MSW for the year 2015. Therefore, recycling of waste glass in construction materials has attracted a lot of interest worldwide due to increased disposal costs. One construction material which has potential to consume bulk glass but received less attention is mortar. Mortar is used as a bonding agent for bricks and is a mixture of water, cement and sand. Therefore, this research examined the feasibility of substituting cement with glass in mortar mixes. A total of 12 mixes containing different proportions of cement, sand, coarser glass, finer glass and water were prepared and tested for strength. Results showed glass could be a potential substitute of cement in mortar up to a certain level. Strength was also found sensitive towards percentage of finer and coarser proportion of substituted glass.

A COMPARISON OF LABOR & DELIVERY IN HOSPITALS VERSUS BIRTHING CENTERS: ADVANTAGES & DISADVANTAGES

Group Leader	Jackson, Morgan Undergraduate, Nursing
Group Members	Marissa Oliver, Undergraduate, Nursing; Amanda Healy, Undergraduate, Nursing; Katie Middleton, Undergraduate, Nursing
Mentor	Prof. Denise Hammer

Birthing centers are on the rise in the obstetric community, becoming more popular each year. They currently comprise less than one percent of all births in the United States. However, that number is quickly growing. With so many expecting families beginning to explore the possibilities of birthing centers rather than hospitals, research is needed on the benefits and risks of each option. While birthing centers may be fitting for some expectant families, they may not be safe for others. The aim of this research project was to gather all advantages and disadvantages of each setting in order to have a clear comparison of the two. Families may then be able to decide which option is best for their individual birthing experience.

GRACEFUL LABELING OF SPIDERS

Group Leader	Kaminsky, Lia Undergraduate, Business Administration
Group Member	Emily Gutzler, Undergraduate, Mathematics
Mentor	Prof. Songling Shan
Authorship	Lia Kaminsky; Emily Gutzler

Let G be a graph with m edges. The graceful labeling of G is a function $f : V(G) \rightarrow \{0, 1, \dots, m\}$ such that distinct vertices receive distinct numbers and $\{|f(u) - f(v)| : uv \in E(G)\} = \{1, 2, \dots, m\}$. A tree is a spider if only one of its vertices has a degree of at least 3 and all remaining vertices have at most degree 2. In this study, we focus on showing that every spider with all but at most two leg lengths being 2 is graceful by exploring multiple cases.

IDENTIFICATION OF NATURAL GENE VARIANTS ASSOCIATED WITH MUSCULAR STRENGTH AND DISEASE RESISTANCE

Group Leader	Leonard, Nicholas Undergraduate, Biological Sciences
Group Members	Evan Gustafson, Undergraduate, Biological Sciences; Chance Bainbridge, Graduate, Biological Sciences
Mentor	Prof. Andres Vidal-Gadea
Authorship	Nicholas Leonard; Evan Gustafson; Chance Bainbridge; Andres Vidal-Gadea

Genetic variability across individuals has been associated with differential susceptibility and resistance to disease. Identifying the genetic basis for variable resistance to disease can shed light on molecular pathways amenable to treatment interventions. We use the nematode *C. elegans* to identify molecular pathways associated with muscle strength, and with resistance to loss of dystrophin in Duchenne muscular dystrophy. We assess the locomotor ability and muscular strength of fully sequenced wild type *C. elegans* isolates to identify strains with increased strength. To do this, we built an automated animal tracker able to quickly and efficiently produce kinematic assessment of many animals simultaneously. Identification of gene variants unique to these animals will highlight molecular pathways associated with increased muscle performance in healthy animals. To identify additional pathways conferring resistance to the progression of Duchenne muscular dystrophy, we use RNA interference to render wild isolates dystrophic prior to evaluating their muscle strength and disease outcomes. We did this by building a worm robot (Wormbot) capable of automatically measure and quantify the ability of animals to tunnel through high density agar. Gene variants found to confer increased muscular strength or resistance to loss of dystrophin will single out targets able to improve disease outcomes in these patients.

IT DOESN'T ADD UP: PERCEPTION OF MAXIMUM REACHING HEIGHT WITH AND WITHOUT A TOOL

Group Leader

Marasco, Nicolas

Undergraduate, Psychology

Group Member

Nate Washington, Undergraduate, Psychology

Mentor

Prof. Jeffrey Wagman

Performing everyday behaviors requires perceiving whether, when, and how such behaviors can be performed. Such opportunities for behaviors are known as 'affordances.' We investigated perception of affordances for vertical reaching with and without and hand-held tool. Participants instructed the experimenter to adjust the vertical position of a marker so that it was the tallest height they could reach if they were to (1) reach up with the fingers of their preferred hand or (2) reach up with the tip of a tool held in the preferred hand. The results showed that perception of maximum reaching height was not an additive combination of properties of the body (and properties of the tool).

DIFFERENTIAL PREDICTORS OF YOUTHS' INTENTIONAL AND SPONTANEOUS HELP-SEEKING DECISIONS

Group Leader	Melecio, Christopher Undergraduate, Psychology
Group Member	Tyler Pederson, Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Authorship	Christopher Melecio; Tyler Pederson; Jeremy Kanter; Daniel Lannin; Luke Russell; Ani Yazedjian

Problem or Major Purpose: The present study examines predictors of intentions to seek help for romantic relationship issues versus in-vivo decisions to seek help among diverse youth enrolled in a relationship education program. Health behavior theories have often considered intention-the conscious plan to perform a behavior-a proximal predictor of help-seeking behaviors (Ajzen, 2011). However, willingness-one's openness to perform a behavior given the opportunity-may reflect situations where more spontaneous decision-making is salient (Gibbons, Houlihan, & Gerrard, 2009). Youth may evaluate their personal need for help with their relationships, weigh treatment options, and consider their readiness for change (Cauce et al., 2002). Therefore, we hypothesized relationship help-seeking intentions and spontaneous decisions to seek relationship information would be predicted by perceived family difficulties, relationship status, and readiness to change.

SCIENCE LITERACY FOR GENERAL EDUCATION AT ISU: A PILOT STUDY

Group Leader	Moore, Madeline Undergraduate, Communication
Group Member	Jared Cihlar, Undergraduate, Chemistry
Mentor	Prof. Rebekka Darner
Co-Mentor	Prof. Alicia Wodika
Authorship	Guang Jin; Alicia Wodika; Rebekka Darner; Jianwei Lai; Jared Cihlar; Madeline Moore

This study aims to identify aspects of classroom culture that promote scientific literacy, specifically accuracy-oriented reasoning, in an online environmental health general education course through discussion of controversial topics via forums, problem sets, and public policy voting scenarios. Forums focused on topics related to sustainability, e-waste, emissions, and GMOs. Three problem sets were developed to stimulate students' accuracy-oriented reasoning regarding immigration and economics, GMOs, and bottled water quality. Students (n=28) were prompted to work through a series of questions and provide their qualitative and quantitative feedback. These questions were designed to identify specific aspects of the classroom culture that facilitate motivation toward accuracy goals. To evaluate whether the learning experience fostered accuracy-oriented reasoning, a pre-post public policy voting scenario assessment was implemented at the beginning and the end of the course. This assessment focused on a controversial topic with factual-based and opinion-based types of evidence (n=10) and from credible sources and non-credible sources. Students' time spent on the voting assessment decreased from pre (M=39.13 min) to post (M=16.69 min) with the number of evidences analyzed also decreasing pre (M=9.6) to post (M=3.92). Qualitative responses to support their voting decision were also analyzed using a practical inquiry model for critical thinking.

FEARS OF BEING SINGLE: EFFECTS OF SEX AND SHYNESS

Group Leader	Mulligan, Mary Undergraduate, Sociology/Anthropology
Group Members	Angela Yonan, Undergraduate, Sociology/Anthropology; Christian Maynard, Undergraduate, Sociology/Anthropology
Mentor	Prof. Susan Sprecher
Authorship	Mary Mulligan; Angela Yonan; Christian Maynard

Shyness, or the feeling of tension and awkwardness in social situations (Cheek & Buss, 1981) has been researched in the past and has been found to be increasing over time (Henderson, Gilbert, & Zimbardo, 2014). Our research aims to investigate how shyness is associated with fear of being single, which is a new construct introduced a few years ago. Fear of being single is defined as "concern, anxiety, or distress, regarding the current or prospective experience of being without a romantic partner," (Spielmann et. al., 2013:2) and is assessed using Spielmann et. al.'s (2013) Fear of Being Single Scale (FOBS). Research by Spielmann et al. and others indicates that people vary in the degree to which they fear being single, and scores on FOBS have been found to be associated with several other individual difference variables, including attachment style, rejection sensitivity, and level of romantic media consumption (Spielmann et al., 2013; Mikulincer, Gillath, & Shaver, 2013). To our knowledge, however, prior research has not examined how people's shyness (or social anxiety) may be associated with their FOBS. We hypothesize that those who are shy will report more anxiety about being single than those who are not shy. Using secondary data analysis of a large sample of single adults (mean age = 24.66) collected by Dr. Susan Sprecher at Illinois State University and through social media, preliminary findings suggest that there is a positive statistically significant correlation between shyness and fears about being single. Further analyses will focus on whether the association differs for men and women, and how men and women differ in their scores on both individual difference variables.

FOOD INSECURITY / SWIPE OUT CHALLENGE ON ILLINOIS STATE UNIVERSITY CAMPUS

Group Leader	Murray, Ainsley Undergraduate, Health Sciences
Group Members	Jessica Krohn, Undergraduate, Health Sciences; Leah Benner, Undergraduate, Health Sciences; Meghan Mathews, Undergraduate, Health Sciences
Mentor	Prof. Jacqueline Lanier
Authorship	Jessica Krohn; Leah Benner; Meghan Mathews; Ainsley Murray

The purpose of this needs assessment was to assess and understand the underlying causes of food insecurity and address the Swipe Out Challenge as a possible solution for food insecurity among college students at Illinois State University. The Swipe Out Challenge allows students with dining hall meal plans to donate a certain portion of their meals (swipes) to their peers. This assessment was important to understand because food insecurity impacts the health and well-being of students on campus. In this mixed methods approach, data was collected from interviews with staff and students as well as using secondary data sources. This research asked: What are the underlying causes of food insecurity on the campus at Illinois State University, how does food insecurity impact students, and how would the Swipe Out Challenge address food insecurity on campus as well as what would be the willingness of students to participate in this program.

SOCIAL SUPPORT, PERCEIVED OSTRACISM, AND POSTTRAUMATIC STRESS SYMPTOMS AMONG VETERANS

Group Leader	Myers, Julie Undergraduate, Psychology
Group Member	Miette Daluga, Undergraduate, Psychology
Mentor	Prof. Eric Wesselmann
Co-Mentors	Prof. Mark Olson and Mark Swerdlik

Posttraumatic stress (negative psychological experiences as a result of the stressors encountered during combat) can hinder military veterans' reintegration into society and cause various mental health problems. Combat veterans need quality social relationships to facilitate reintegration and to cope with posttraumatic stress and related mental health problems; discrimination or other forms of interpersonal rejection can exacerbate these veterans' problems. One type of threat to social relationships, ostracism (i.e., being ignored and excluded), is a painful and psychologically distressing experience that may be one factor contributing to the problems of veterans dealing with posttraumatic stress. People do not always have to be directly ignored to feel ostracized; sometimes unintentional interpersonal slights (e.g., hurtful comments, checking one's cellphone during a conversation) can make people feel ostracized. Research suggests that one reason for this may be that these slights make people feel as if they are not valued in that relationship. Another way that people are made to feel less valued in their relationship is when they receive poor social support (support efforts that may be well-meaning but do not match what the recipient wants or perceives as helpful).

We investigated the potential connections between social support, feelings of ostracism, and psychological need satisfaction (e.g., feelings of belonging, self-esteem, control, and meaningful existence; Williams, 2009) among a sample of previously deployed Illinois National Guard veterans (N = 80). Participants were randomly assigned to recall an autobiographical event: 1) the last time they had breakfast (control condition), 2) a time in which they received helpful social support from a civilian, or 3) a time in which they received unhelpful social support from a civilian. Participants described their assigned memory in an open-ended text box. They then completed measures related to feelings of ostracism based on how they recalled feeling during the event.

Participants who recalled an unhelpful support interaction recalled feeling more ostracized and lower basic need satisfaction than participants in the other two conditions ($ps \leq .006$, $\eta^2s \geq .27$). We are currently analyzing the written responses to identify specific themes in both helpful and unhelpful social support interactions.

These data provide preliminary evidence for a connection between social support and feelings of inclusion/exclusion. Our qualitative findings will provide future directions both for research and for suggestions for giving veteran's quality support.

GRACEFULNESS OF SPIDERS WITH LEG LENGTH AT MOST 3

Group Leader	Nottoli, Jacob Undergraduate, Mathematics
Group Member	Anna Janaszak, Undergraduate, Mathematics; Eva Yang, Undergraduate, Mathematics
Mentor	Prof. Songling Shan
Authorship	Anna Janaszak; Jacob Nottoli; Eva Yang

Let G be a graph with m edges. A graceful labeling of G injectively assigns integers from the set $\{0,1,2,\dots,m\}$ to the vertices of G so that the absolute difference between each vertex includes every number in the set $\{1,2,\dots,m\}$. We say that G is graceful if there exists a graceful labeling of G . A spider is a tree that has one vertex of degree at least three and every other vertex of degree at most 2. We intend to prove that every spider with each leg length being at most 3 is graceful.

HIGH THROUGHPUT ANALYSIS OF MAGNETIC ORIENTATION USING THE NEMATODE C. ELEGANS

Group Leader	Owoyemi, Taiyelolu Undergraduate, Biological Sciences
Group Member	Kehinde Owoyemi, Undergraduate, Biological Sciences
Mentor	Prof. Andres Vidal-Gadea
Authorship	Taiyelolu Owoyemi; Kehinde Owoyemi; Nick Leonard; Gaston Risi; Chance Bainbridge; Andres Vidal-Gadea

Many organisms, from bacteria to whales can detect and orient to the magnetic field of the Earth. Many of these magnetosensitive species use magnetic fields for large migrations. While much work has been done on which animals use the magnetic field, the mechanism for magnetic field detection remains unknown. This is in large part due to the difficulty of studying such large scale migratory behaviors, and the lack of genetic tools in magnetosensitive species to uncover genes involved in magnetoreception. Thus, studying mechanisms for magnetic field detection would be aided by being able to study this behavior on a smaller scale in an animal amenable to genetic approaches. We recently showed that the nematode *C. elegans* can detect and orient to the magnetic field of the Earth. Since *C. elegans* are small organisms, they are able to be monitored in the lab. Many genetic tools are available to study *C. elegans*. This provides us a manageable experimental framework from which to study this behavior, and positions us to uncover the mechanisms for magnetic orientation.

EFFECTS OF TYPE OF PROCESSING ON FACIAL RECOGNITION

Group Leader	Ritter, Taylor Undergraduate, Psychology
Group Member	Amanda DeVore, Graduate, Psychology
Mentor	Prof. Dawn McBride
Authorship	Taylor Ritter; Amanda DeVore

Facial recognition varies such that faces can be encoded either globally (wholly) or locally (in parts). This study explored global versus local processing of emotionally expressive faces. Participants were asked to look at a series of pictures that contained different faces emulating happy and angry emotions. They were later asked to recall the faces for an immediate test and a 15-minute delayed test. We hypothesized that angry faces would benefit more from local processing, such that the immediate recall test (where details are still active in memory) would produce better results for angry faces that were processed locally, and that the delayed recall test (where memory relies more on holistic processing) would produce better results for happy faces that were processed globally. The results replicated past results showing that angry faces are better remembered than happy faces at immediate tests, whereas, the reverse is true for delayed tests. However, the type of processing did not influence angry faces at the immediate test as expected.

BENEFICIAL USE OF DREDGED MATERIAL: ADDRESSING THE US ARMY CORPS OF ENGINEER'S SURPLUS PROBLEM

Group Leader	Schelinski, Sara Undergraduate, Geography, Geology, and the Environment
Group Members	Raquel Zvirbulis, Undergraduate, Management and Quantitative Methods; Meghan Glynn, Graduate, Business Administration; Allison Morgan, Undergraduate, Biological Sciences
Mentor	Prof. Pranshoo Solanki

In an attempt of the US Army Corps of Engineers' (USACE) continuous clearing waterways for improved aquatic navigation, a surplus of more than 2,000,000 cubic yards of dredged material between three locations of Sangamon River - Decatur, Il, Mackinaw River - Pekin, Il, and Bull's Island - Ottawa, Il require sustainable repurposing. To resolve this, the beneficial use of this material has been investigated by assessing reports given by the USACE as well as conducting independent research to highlight the best, most feasible use based upon composition, location of the surplus sites, and cost associated with use and transportation of the dredged material. Upon request of the USACE, sustainability and environmental conscientiousness, defined by preserving the use of renewable resources in the future as well as repurposing nonrenewable waste, have also been taken into account. Determinants for the material use and market have been drawn from cold call surveys of potential markets within the state of Illinois with the following focus: landfill covering and lining, university research, green infrastructure/construction, and remediation of soil/habitats. Because this is an ongoing study, preliminary survey results will lead to an established marketability plan that will define the measures for the most suitable project to ensue.

ASSESSING IMPLEMENTATION OF SCHOOL-WIDE SOCIAL AND EMOTIONAL LEARNING EFFORTS

Group Leader	Signa, Caroline Graduate, Psychology
Group Member	Rachel Flores, Graduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Adena Meyers; Abigail Lyons; Caroline Signa; Rachel Flores;

Ample evidence supports the effectiveness of school-based social and emotional learning (SEL) programs, with documented gains in children's interpersonal functioning, emotion management, academic performance, and mental and behavioral health outcomes (Durlak et al., 2011; 2017). These effects depend, in part, on high-quality, consistent implementation by school-based professionals (Durlak, 2015).

To support school systems in their efforts to implement SEL, the Collaborative for Academic, Social and Emotional Learning (CASEL) developed a Theory of Action of SEL Implementation. According to CASEL's model, successful implementation requires shared vision, ongoing assessment, evidence-based SEL programs and practices, professional development and support, and integration of SEL with school and district policies and practices (CASEL, 2018). This study examined a Midwestern school district's application of CASEL's Theory of Action in their initial efforts to implement schoolwide SEL.

During the 2018-19 school year, an SEL Interventionist/Coach was tasked with implementing a schoolwide SEL program in two pilot elementary schools. The coach met regularly with administrators, teachers, and support staff in the pilot buildings and provided formal and informal professional development designed to support efforts to promote children's social and emotional functioning within the pilot classrooms and buildings.

During the fall and spring, teachers (n=129) from the two pilot schools and two comparison schools in the same district completed the CASEL-AIR Staff Survey of SEL Implementation, which assesses six constructs derived from CASEL's Theory of Action, including: 1) developing a vision; 2) assessing needs and resources; 3) professional learning; 4) implementation; 5) schoolwide integration; and 6) continuous improvement. In addition, the scale includes three item clusters that assess constructs of interest apart from the theory of action, including: 1) development of staff commitment for SEL; 2) classroom SEL practices; and 3) district-level SEL practices (Osher et al., 2015).

Analysis of Covariance was used to examine differences between pilot and comparison teachers' endorsement of theory-of-action constructs at the end of the first year of implementation, controlling for baseline scores collected in the fall. It was hypothesized that pilot teachers would demonstrate higher endorsement of theory-of-action constructs, greater commitment to SEL promotion and instruction, and more consistent use of SEL practices in their classrooms than comparison teachers. Implications of the findings for understanding factors influencing SEL implementation will be discussed.

UTILIZATION OF CARBON-FIBER MICROELECTRODE ARRAYS (CF-MEAS) FOR THE DETECTION OF ELECTROACTIVE NEUROCHEMICAL SPECIES

Group Leader	Smith, Brad Graduate, Biological Sciences
Group Members	Sarah Gahan, Undergraduate, Biological Sciences; Jacob Giles, Undergraduate, Biological Sciences; Cassidy Kessinger, Undergraduate, Biological Sciences; Ethan Roberts, Undergraduate, Biological Sciences; Robert Witt, Undergraduate, Biological Sciences
Mentor	Prof. Paul Garris
Authorship	Brad M. Smith; Ashley Salzman; Brittany Rivera; Sarah Gahan; Jacob Giles; Cassidy Kessinger; Ethan Roberts; Robert Witt;

Past research in our lab has focused on uncovering the mechanism of action of amphetamine, a commonly prescribed psychostimulant with high abuse potential. Amphetamine is known to augment phasic dopamine (DA) signaling, a form of fast communication by DA neurons, in regions of the rat brain that are heavily implicated in associating rewards with their predictive cues during reward learning. Detection of this phasic DA signaling requires the use of microsensors that can detect nanomolar changes in DA concentration with sub-second time resolution. Fast-scan cyclic voltammetry (FSCV) at a carbon-fiber microelectrode (CFM) has long been considered the gold standard for the in vivo detection of electroactive chemical species in the brain. This highly sensitive technique results in minimal tissue trauma during electrode implantation and provides the requisite temporal and spatial resolution for monitoring phasic dopamine signaling with high fidelity. Current applications of FSCV are limited, however, by their ability to measure only from a single recording site. Multiple studies suggest that DA is released in a heterogeneous manner in the rat brain, a phenomenon that would require numerous sensing locations to fully characterize. Recent advances in biomedical engineering have led to the development of carbon-fiber microelectrode arrays (CF-MEAs). These CF-MEAs are capable of measuring from up to sixteen in vivo recording sites simultaneously. To determine the feasibility of using CF-MEAs for in vivo studies, characterization of the arrays was performed using flow injection analysis (FIA). FIA is an in vitro chemical analysis technique that allows for electrode calibration in a flowing stream of buffer. Temporal response and sensitivity are assessed by exposing the sensing surface of a CFM or CFM-MEA to a bolus of a solution containing known concentrations of analytes. In combination with FSCV, FIA is used to determine the temporal and chemical sensitivity of sensing surfaces. Here we present findings from FIA and pilot in vivo studies that demonstrate the feasibility of CF-MEA use in larger-scale FSCV studies. Use of CF-MEAs for in vivo data collection will lead to a greater understanding of amphetamine mechanism of action by providing insight into the heterogeneous nature of phasic DA signaling in the rat brain.

RETROFITTING TOWN OF NORMAL PARKING DECKS WITH SUSTAINABLE ENERGY STRATEGIES: LEDS, SOLAR PHOTOVOLTAIC SYSTEMS, AND ELECTRIC VEHICLE

Group Leader	Van Wolvelear, Jake Undergraduate, Technology
Group Members	Nick Foley, Undergraduate, Technology; Martin Huff, Undergraduate, Technology
Mentor	Prof. Jin Jo

Local governments can benefit greatly from energy efficiency improvements in their buildings and lighting structures, saving money on yearly energy expenditures, which equates to lower costs for tax-payers. The application of renewable energy systems can also benefit these local governments and their people - specifically, the Town of Normal and its residents. This paper details a cost-benefit analysis of retrofitting the municipally-owned parking garages of Normal, IL with LED lighting fixtures. Also analyzed in this report is comparisons of the cost-benefit analyses of two additional energy upgrades. The first addition will be a PV superstructure on the top level of the parking garages and the second addition will be electric vehicle (EV) charging stations for each of these two parking garages. In comparing these upgrading options, this study recommends which option is optimal for the Town of Normal: just LEDs, LEDs paired with solar PV modules, or LEDs, PV modules and EV charging stations.

EVALUATING TECHNICAL AND ECONOMIC FEASIBILITY OF DISTRIBUTED COMMUNITY SOLAR AS COMPARED TO SINGLE HOME RESIDENTIAL SOLAR

Group Leader	Votoupal, Matthew Undergraduate, Technology
Group Member	Moize Milor, Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Matthew Votoupal; Moize Milor

The State of Illinois mandates that 25% of its energy demand to be produced from renewable sources by 2025, which is already off the path to reach. The Future Energy Jobs Act (FEJA) estimated that in the 2020-21 fiscal year Illinois should be approaching 17.5% energy generation from renewable sources, but Illinois has reached only 8%. To aid in meeting those Statewide renewable goals, our research explored Hudson, Illinois reasonable potential for locally produced and incentivized solar electricity production coupled with net metering capabilities. With the solar energy market rapidly expanding in the United States, some cannot benefit from it because their homes are unsuitable to install solar panels despite potential benefits.

Our solution is Distributed Community Solar (DCS) which is designed to offer payment to homes willing to provide roof space for solar panels that will provide electricity for themselves and others who purchase the excess energy generated through a subscription service. It is similar to community solar which, according to the Solar Energy Industries Association (SEIA), "refers to local solar facilities shared by multiple community subscribers who receive credits on their electricity bills for their share of the power produced." DCS differs by offering less space demanded by using current roof space of optimal locations rather than producing a large solar farm. DCS also, with the aid of net metering, will reduce transmission losses. Hudson, Illinois is chosen specifically because it is a small rural community without present use of solar panels. It will act as a model to be potentially replicated for other rural communities in desperate need of renewable resources. We present the evaluations of different solar home designs to implement single home solar systems and DCS models while finding the best situation for each design. An evaluation of different payment plans is included as well as an analysis of the application of each model to two different subdivisions. The evaluation defines the benefits and detriments for each while simultaneously finding each case's best applicable scenario. Outcomes of the research prove the best models for homes and budgets, offering solutions to provide families with long-lasting benefit, and to help Illinois reach its renewable energy production target.

SYNTHESIS AND CHARACTERIZATION OF RUTHENIUM-BASED ALZHEIMER'S DISEASE THERAPEUTICS

Group Leader	Wall, Brendan Undergraduate, Chemistry
Group Member	Mark Will, Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Brendan Wall; Mark Will; Michael Webb

Amyloid-beta ($A\beta$) peptide aggregation is a primary characteristic of Alzheimer's disease (AD), the most common neurodegenerative disorder. $A\beta$ peptide aggregates have been observed to contain the redox-active metals, copper and zinc, which lead to the generation of reactive oxygen species which are damaging to nearby neural membranes, and is the basis for the development of AD. Given the affinity of $A\beta$ peptide aggregates for metal ions present in the brain, metal-based therapeutics should offer an alternative target for $A\beta$, preventing aggregation and reactive oxygen species. The ruthenium metal complex, imidazolium trans-tetrachloro(dimethylsulfoxide)imidazoliumruthenium(III) (NAMI-A) has been studied for its effect on binding the $A\beta$ peptide and have proven effects in preventing $A\beta$ aggregation. However, questions regarding the relationship between the ligands around the ruthenium metal center, and the complex's activity need to be defined to advance development of ruthenium-based AD therapeutics. We have prepared pyridine-based NAMI-A derivatives and have begun to characterize their interactions with $A\beta$. Preliminary data shows that there is association between our derivative complexes and the $A\beta$ peptide, further evaluations of this interaction are ongoing and will be discussed.

IMPROVING WATER QUALITY THROUGH REDUCING AGRICULTURAL NUTRIENT LOSS: FIELD PENNYCRESS AS A COVER CROP

Group Leader	Wang, Mujen Graduate, Geography, Geology, and the Environment
Group Member	Stephanie Van Wolvelaar, Undergraduate, Biological Sciences
Mentor	Prof. Bill Perry
Authorship	Mujen Wang; Stephanie Van Wolvelaar; Bill Perry

Agricultural nutrient loss through water runoff from the Upper Mississippi (UM) River Basin is one of the major contributing sources to the Gulf of Mexico hypoxic dead zone. To combat the growing dead zone, Illinois is collaborating with regulatory agencies to develop a comprehensive strategy to reduce nutrient loss from agricultural fields. Cover cropping has been identified as one strategy for farmers to use to reduce nutrient loss from their fields and improve soil quality at the same time. However, the high cost and slow economic return rate of implementing cover crops has prevented farmers from widely adopting traditional cover crops.

Field pennycress (*Thlaspi arvense*) is an emerging potential "cash cover crop" species that may provide the benefits of traditional cover crops and the economic incentive (biofuel potential) farmers need to widely implement cover cropping in their fields. However, the effectiveness of pennycress at reducing nutrient loss compared to traditional cover crop species needs to be determined. To investigate pennycress' potential as a cover crop, we designed a replicate plot experiment in collaboration with ISU research farm. Three sets of replicate plots will receive three separate treatments following regular cash crop: reference plots with no field pennycress, field pennycress plots, and field pennycress plots with additional nitrogen fertilizer. Field pennycress is planted following cash crop harvest in early fall and grows throughout late fall to early spring. To assess the nutrient concentration change in the plots we use field lysimeters to measure soil pore water nutrient concentrations. Samples will be collected throughout early spring during peak field pennycress growth. We predict pennycress plots will reduce pore water nutrient concentrations with the added nitrogen treatment having potentially higher nitrogen levels and reference plots having the highest nutrient concentrations. If the results indicate pennycress was as effective at reducing nutrients as traditional cover crops, it can be a great new additional "cash cover crop" for farmers to use to reduce nutrient loss while making a profit.

COLLEGE-AGE WOMEN'S PERCEPTION OF MEDIA CONTAINING HIGH VERSUS LOW AMOUNTS OF VOCAL FRY

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Mentor	Prof. Lisa Vinney
Authorship	Alyssa Ward; Josephine O'Shaughnessy; Erin Logsdon

Introduction and Objectives: Research suggests that the use of vocal fry has become more prevalent among young college-age females. It is unclear whether college-age women perceive audio-only media with persistent fry use more positively, leading to their own use of this register. In previous studies, acoustic and perceptual characteristics of the voice have been linked with the listeners' perception of speakers' likeability and personality traits like trustworthiness and dominance. However, studies have not specifically investigated whether college-age women perceive a greater degree of homophily (perceived connection with similar others), and wishful identification (the aspiration to adapt the characteristics of an admired figure) with speakers who do or do not use high amounts of glottal fry. To fill this gap in knowledge, this study examined college-aged women's perceived wishful identification and homophily with a speaker using high or low amounts of glottal fry within audio-only media.

Methods: To investigate this topic, college-age female participants were randomized into a condition in which they listened to a four-and-a-half minute audio-recording of a speaker either intentionally using large (high fry condition) or minimal amounts of vocal-fry (minimal fry condition). Each participant then rated the speaker's perceived likeability as well as her wishful identification and homophily with the speaker on self-report measures designed to assess each construct.

Results and Discussion: Statistical measures will examine whether perceived likeability, wishful identification, or homophily significantly differ between the high fry versus minimal fry conditions. Results may provide context for habitual vocal fry usage in college-age women.

FEASIBILITY OF APPLYING ILLINOIS SOLAR FOR ALL TO THE BLOOMINGTON NORMAL WATER RECLAMATION DISTRICT

Group Leader	Winters, August Undergraduate, Technology
Group Member	Chris Thankan, Undergraduate, Technology
Mentor	Prof. Jin Jo

This research study assesses the feasibility of solar energy at the Bloomington Normal Water Reclamation District (BNWRD) in Bloomington, IL through the framework of the Illinois Solar For All (ISFA) program. ISFA is a state funded energy finance program dedicated to promoting and proliferating solar energy throughout Illinois for low-to-moderate income residents, non-profits, public facilities, and environmental justice communities. The BNWRD is a wastewater treatment plant that resides in an environmental justice community located in west Bloomington. After acquiring energy consumption data from the BNWRD, we use it in conjunction with satellite mapping tools to estimate the total electricity generated by a potential on-site solar energy system. Potential financing of the solar array according to the various financial structures established by the ISFA is simulated with Helioscope and the National Renewable Energy Laboratory's System Advisory Model (SAM) software. These two solar simulation tools assisted in the creation of our system. We also explore the technical feasibility and cost saving benefits of different solar systems such as roof-mounted system, ground-mounted system, and axis-tracking systems. The outcome of our project demonstrates the significant energy savings the ISFA program can provide for the BNWRD. Our research provides an ideal solar array system and financing plan to be used by the BNWRD through the ILSFA program. Potential vendors and facilities in Illinois intending to utilize the ILSFA program can reference our research to seek a better understanding of the functionality of the program. Through this project we will break down the stigma that solar energy is unobtainable and unaffordable, and we will demonstrate the accessibility that the ILSFA program has provided to the state of Illinois.

EFFECTIVE SUPPORT STRATEGIES FOR WOMEN CONCERNED ABOUT TONGUE-TIE IN BREASTFEEDING INFANTS

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Group Members	Kayla Gettemy, Undergraduate, Communication Sciences and Disorders; Julia Pianko, Undergraduate, Communication Sciences and Disorders; Grace Watson, Communication Sciences and Disorders; Nicol Musielak, Communication Sciences and Disorders; Brianna Szambelan, Communication Sciences and Disorders;
Mentor	Prof. Jamie Smith
Authorship	Shae Wrage; Kayla Gettemy; Julia Pianko; Grace Watson; Nicol Musielak; Brianna Szambelan

In 2-11% of infants, the tissue connecting the tongue to the floor of the mouth restricts movement of the tongue during feeding. This is known as a tongue-tie. Frenotomy, or surgery for the correction of tongue -tie among breastfeeding babies, can be a controversial topic. This is especially true when breastfeeding women are gathering advice online. Unfortunately, the information obtained can be of varying quality. Advice in social media settings may be misleading or uninformed. Participants may encourage treatments that are very costly and medically unnecessary. Social media breastfeeding support has the capability to both positively and negatively affect feeding-related decisions. Given the many unanswered questions regarding optimal tongue-tie management, effective online support remains a complex undertaking with uncertain outcomes.