

2018 Symposium

Individual Abstracts – Afternoon Session

QUEUEING DELAY MEASUREMENT IN THE INTERNET ROUTERS

Presenter	Ajmeri, Aasif Undergraduate, Technology
Mentor	Prof. Khondaker Salehin
Authorship	Aasif Ajmeri

We study a probe-gap scheme to measure queueing delay of Internet routers through computer simulation. The scheme is based on estimating the changes of the intra-probe gap between a pair of probing packets after they traverse all routers over a network path. The simulation results show that this scheme consistently achieves high measurement accuracy under different levels of queueing delay over single- and multiple-hop paths.

THE EFFECTIVENESS OF ONLINE PROFESSIONAL DEVELOPMENT IN PROMOTING TECHNOLOGY INTEGRATION IN SAUDI ARABIA

Presenter	Alahmari, Ayshah
	Graduate, Teaching and Learning
Mentor	Prof. John Rugutt
Authorship	John Rugutt

The purpose of this study was to assess teachers' perspectives about the effectiveness of online professional development in promoting technology integration in Saudi Arabia and to identify the perceived factors that contribute to the success of online professional development in Saudi Arabia. The study explored the possible differences in perceived effectiveness of online professional development based on participant's demographic information, technology skills, attending online professional development, number of hours attended, and enrollment in Teaching with Technology (TWT) initiative. Additionally, this study investigated the affordances for autonomous learning in a fully online learning environment for effective online professional development. The ANOVA results indicated significant mean differences in teachers' responses across gender ($F(1, 143) = 2.27, p < 0.05$) and also across enrollment in TWT initiative ($F(2, 143) = 10.01, p < 0.05$). Gender and TWT accounted for 5.5% and 6.5% of variance in Teacher Overall Perspectives about the effectiveness of online professional development respectively. The study major findings and conclusions of the study are also discussed in view of their implications for future research, measurement theory, research design and practice in the manuscript.

WHAT ARE THE VALUES OF BOTH NARCISSISTIC DIMENSIONS?

Presenter	Anello, Kelsey Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Authorship	Kelsey Anello; Daniel Lannin

The present research examines links between narcissism and Schwartz's (1992) value circular value structure. Though most narcissistic people display self-aggrandizement (Murray, 1938), there is growing consensus that narcissism entails two dimensions: a grandiose aspect that is interpersonally domineering and demanding of attention, as well as a vulnerable aspect that feels socially inadequate and experiences negative emotionality (Cain et al., 2008). The present study examines higher-order values motivated by the pursuit of enhancing the wellness of others (the "self-transcendent values") oppose those focused on enhancing status and success (the "self-enhancement values"). We hypothesized that grandiosity would be a strong positive predictor of self-enhancement values, and a strong negative predictor of self-transcendent values; we predicted effects in the same direction, with smaller effect-sizes, for vulnerable narcissism. The results show that grandiose narcissism exhibited strong positive relationships with higher order values such as self-enhancement, with strong negative relationships with conservation and self-transcendence. Narcissistic vulnerability was also linked positively to self-enhancement and negatively to self-transcendence, but with weaker effects.

FORMATION OF ILF-LIKE STRUCTURES IN HATCHLINGS *T. SCRIPTA*

Presenter	Ashford, Marc Graduate, Biological Sciences
Mentor	Prof. Laura Vogel
Co-Mentor	Prof. Rachel Bowden
Authorship	Marc Ashford; Jake Jasinski; Sarah Palackdharry; Rachel Bowden; Laura Vogel

Gut-associated lymphoid tissue (GALT) is vital for protection against ingested pathogens and maintenance of normal gut microbiota. While much is known about the mammalian gut and lymphoid tissues associated with it, gut immunity is much less understood in reptilians. Of particular interest are small structures called isolated lymphoid follicles (ILF), consisting primarily of B cells, found throughout the small intestine. In mammals, the formation of the ILF is not developmentally driven like other lymphoid tissues such as Peyer's Patches, but is rather dynamic and induced through antigenic stimulation and diet. We have now identified ILF-like structures in *Trachemys scripta*. Our preliminary studies have shown high variation in the presence and location of these structures in hatchling animals by use of a specific primary antibody to turtle Ig (HL-673). To determine if the observed ILF-like structures are inducible, similar to those in mammals, we will introduce enteric *Salmonella* through oral gavage to hatchling turtles and allow colonization. Gut tissue will then be analyzed through whole mount immunohistochemistry for the distribution of B cell presence. These studies will provide novel information about gut immunity in non-mammalian vertebrates.

INVESTIGATING INTERNAL STATE DRIVEN DECISION MAKING USING C. ELEGANS MAGNETIC ORIENTATION

Presenter	Bainbridge, Chance Graduate, Biological Sciences
Mentor	Prof. Andrés Vidal-Gadea
Authorship	Chance Bainbridge; C. Caldart; Ben Cites; Bridgitte Palacios; Layla Bakhtiari; Wolfgang Stein; A. Golombek; Jonathan Pierce- Shimomura; Andrés Vidal-Gadea

A requirement for survival in all animals is the ability to detect, integrate, and orient to a multitude of different environmental cues with varying information content and salience. Some high salience stimuli produce stereotypical behavioral responses regardless of context (e.g. avoidance of noxious thermal stimuli). However, other stimuli elicit responses that may be time and/or context dependent (e.g. pursuing prey). While much is known about how animals orient to unambiguous stimuli, little work has focused on how animals process context-dependent sensory information. Like other magnetosensitive animals, the nematode *C. elegans* orientation to magnetic fields depends on its internal state. Here we characterize shifts in animal orientation to magnetic stimuli associated with internal (satiation) variables. We find that worms orientation to magnetic fields displays a bimodal distribution over our 100 minute time intervals. In the absence of competing stimuli, worms initially strongly adopt a preferred alignment with respect to the local magnetic field. This preference then recedes and then reappears only after 60 minutes at which point the migratory direction appears flipped with regards to its initial display. These data suggest that worms use of magnetic fields, and the polarity of this response, are determined by time-dependent internal factors (e.g. satiation). The polarity preference of migrating worms was validated in a series of separate experiments performed by collaborators in Texas and Quilmes (Argentina). Magnetic orientation in *C. elegans* is a useful tool to investigate the state dependent factors affecting decision making. This will help us understand how adaptive behavior emerges from the dynamic interaction between complex internal and external environments.

OVER-EXPRESSION OF P38 MAP KINASE MAY PLAY A ROLE WITH PROTECTION OF NEURONS IN DROSOPHILA

Presenter	Baker, Robert Undergraduate, Biological Sciences
Mentor	Prof. Alysia Mortimer

Oxidative stress is thought to be the cause for a lot of different diseases and deterioration of tissues. Oxidative stress is when the body cannot control the levels of radical oxygen species (ROS) and when these levels are in excess this can cause damage to the tissues. In normal functioning of the mitochondria ROS are produced, but when the function becomes impaired this allows for the damaging levels of ROS to tissues. For example, in Parkinson's Disease, the degeneration of dopaminergic neurons in the substantia nigra of the brain is thought to be partially caused by impaired function of the mitochondria. p38 MAPK (p38Kb) is protein that helps deal with oxidative stress in the body. My goal is to determine whether or not p38 MAP Kinase will help neuronal stability in *Drosophila Melanogaster*. To do this, I will test how p38Kb protects neurons when flies are exposed to different PD risk factors such as aging and exposure to paraquat, which is a pesticide that is linked to PD. I will express p38Kb in the DA neurons and assay if this prevents neuron loss with aging. I will also expose control flies and p38Kb over-expression flies to low levels of paraquat at young, middle and old ages and assay for neuronal loss. My preliminary data suggests that p38Kb protects certain groups of DA neurons during aging.

DISCIPLINARY PRACTICES AMONG PRE-SERVICE TEACHERS

Presenter	Baldwin, Kara Esther Graduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authorship	Kara Esther Baldwin; Rebekka Darner

Both the Next Generation Science Standards (NGSS) and the Common Core State Standards for Mathematics (CCSSM) highlight the importance of disciplinary practices of science and mathematics. The disciplinary practices outlined in the standards provide a framework that focuses on engaging students in behaviors typical of mathematicians and scientists in order to develop conceptual understanding. In the wake of these reform documents, developing an understanding of the scientific and mathematics practices is essential for teachers to be effective.

Because disciplinary practices are interwoven into the framework of the standards, it is reasonable to consider teacher understanding within the disciplinary practices. With limited research studies on disciplinary practices, this study uses interview data to consider pre-service teacher understanding of disciplinary practices prior to the bulk of their teacher education coursework.

DISCOVERY ACADEMY COMPARISON OF GENDER ATTITUDES TOWARD SCIENCE

Presenter	Baldwin, Kara Esther Graduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authorship	Kara Esther Baldwin; Rebekka Darner

Discovery Academy, a two-week summer camp for middle school students, strives to increase student attitudes toward science and mathematics through hands-on and inquiry-based learning activities. In order to evaluate if this camp experience changed student attitudes toward math, the researchers utilized the Science and Mathematics Student Motivation Assessment (SMSMA).

This assessment, developed by Weinberg, Basile, and Albright (2011), measures student interest, utility, cost, attainment, and expectancy of success to measure student attitudes toward mathematics and science. This study compares pre- and post-camp SMSMA data for middle school students by gender to assess the impacts of Discovery Academy on middle school interest in STEM.

SOLO AND THE DEMONSTRATIVE PRONOUNS IN SPANISH: DIACRITICAL ACCENT AND THE DIACHRONIC STUDY OF ITS CHANGES

Presenter	Basterretxea Santiso, Gorka Graduate, Languages, Literatures and Cultures
Mentor	Prof. Patxi Lascurain-Ibarlucea
Authorship	Gorka Basterretxea Santiso

During a significant part of the history of the Spanish language, the diacritical accent has had the role of establishing a distinction between two homonym words that carry different meanings and functions. The goal of this written accent was to avoid semantic misunderstandings of the homonym words of which some examples can already be found in 1492. This type of accent has had several changes and developments until the year 2010 when "Real Academia Española" (RAE) decided to give an end to this accent mark in words like solo and the demonstrative pronouns. The present study is based on a diachronic analysis of the development and different functions that the diacritical accent has had during its history, from 1492 to 2010. This paper analyzes the linguistic and historical reasons for which the members of RAE believed that its use was no longer necessary. The hypothesis of this paper is that the decision could have been motivated by Spanish speakers' ignorance about the function of the diacritical accent or by the unnecessary existence of this accent mark proved with historical and grammatical facts. Key words: Spanish, (written) accent, diacritic, solo, demonstrative, pronoun, diachronic, homonym, unaccented, ambiguity, grammar, spelling.

NEW SUPERVISED AND UNSUPERVISED MACHINE-LEARNING METHODS ON P38 MAPK LONGEVITY REVEALS REGULATION OF AGE-DEPENDENT DISEASE PROTEINS

Presenter	Becerra, Basheer Undergraduate, Information Technology
Mentor	Prof. Alysia Mortimer
Co-Mentor	Prof. Nathan Mortimer
Authorship	Basheer Becerra; Sarah Ryan; Josh Hill; Morgan McCall; Kyoko Kojima; Jim Mobley; Nathan Mortimer; Alysia Vrailas-Mortimer;

Maintaining protein homeostasis is an important aspect of cellular health, however, this process becomes impaired with aging leading to cellular dysfunction. We have previously found that the stress response protein p38 MAPK (p38Kb) regulates lifespan and age-dependent locomotor behaviors in *Drosophila*, via a novel role in mediating protein homeostasis. We have developed new machine-learning approaches to perform proteomic analysis of muscle and brain tissues across the entire lifespan of the long-lived p38Kb over-expression animals, short-lived p38Kb mutants, and genetic background controls to determine the changes in the proteome that may be influencing longevity versus accelerated aging. Using unsupervised cluster analysis of differentially expressed proteins, we have discovered sets of proteins enriched with functional annotations. We also used cluster analysis to infer regulatory interactions between differentially expressed proteins. Using supervised machine learning to identify predictors of aging in control flies, we find that the brain and muscle age differently with unique suites of proteins driving the aging process. We also used our machine learning model to predict the age of p38K over-expression and mutant animal samples. We find that the long-lived p38K over-expression animals exhibit a younger profile. Conversely, loss of p38K leads to an accelerated shift with animals prematurely entering older profiles. Interestingly, we find that p38K regulates the levels of a subset of these muscle and brain aging predictor proteins, suggesting that p38K may coordinate a node that drives the normal rate of aging.

INFLUENCE OF THE METHYL GROUP IN THE ELECTRON SPIN DISTRIBUTION IN N-METHYL BENZOTRIAZOLE ANION RADICALS

Presenter	Beres, Daniel Undergraduate, Chemistry
Mentor	Prof. Steven Peters
Authorship	Steven Peters; Daniel Beres

Benzotriazoles have many uses in pharmaceuticals and photovoltaics. N1-Benzotriazole derivatives can be used for antibacterial, antioxidant, and antifreezes among others, while the N2-Benzotriazole polymers easily accept electrons, allowing them to be used in organic photovoltaics.

Although myriad chemical studies have been performed on these systems, it is interesting that studies involving their one electron reduction have largely been unexplored.

We have performed alkali metal reductions on both of these molecular compounds in polar aprotic solvents to determine how the placement of the methyl group affects electron spin density within the triazole moiety. The anion radicals of both compounds were generated and detected using Electron Paramagnetic Resonance (EPR) spectroscopy.

Our results reveal considerable differences in the distribution of electron spin within these two anion radicals.

POLITICAL ENGAGEMENT: THE YOUTH OF EGYPT AND TUNISIA SINCE THE ARAB SPRING

Presenter Berta, Zachary
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

Civic engagement played a significant role in creating and spreading the social unrest that led to widespread uprisings in the Middle East. Furthermore, the mobilization of the region's youth was an integral part of the power behind the movement. Since the Arab Springs the region has seen different levels of success in creating greater political rights and civil liberties. Tunisia has transitioned into a rudimentary democracy with a functioning constitution that has resulted in a politically neutral military and freely elected officials from the seventy parties that have formed. Egypt, however, has become more authoritarian since President Abdel Fattah al-Sisi took power in 2013.

This has led to corruption and a lack of free elections, along with a drawback on civil liberties such as the right to associate and freedom of movement. Given the vast difference in outcomes between these two countries, it is important to better understand the political participation of these countries' largest segment of politically eligible citizens, the youth.

My paper will ask the following question, in what ways might political engagement among Egyptian and Tunisian youth have changed since the 2011 Arab Spring uprisings? I will use the compare and contrast methodology for my research design. Using national voter data from presidential and parliamentary elections along with poll and survey data, the paper will attempt to provide a better understanding of how the youth of the two countries politically participate through voting and activism.

PERVIOUS PLASTIC CONCRETE FOR SUSTAINABLE PAVEMENTS

Presenter Bhattarai, Samikaran
 Graduate, Technology
Mentor Prof. Pranshoo Solanki

The growing amount of post-consumer plastic bottles has resulted in the accumulation of plastic wastes and causes serious environmental problems due to littering and illegal landfilling or incineration. One of the recycling methods of plastic bottles is using it in concrete which is one of the most widely used construction materials. The review of the literature indicated that using plastics in conventional concrete is cost-efficient and improves properties such as toughness and durability. However, to the author's knowledge no study attempted recycling of post-consumer polyethylene terephthalate (PET) waste bottles in sustainable pervious materials. Therefore, the primary objective of this study was to develop and evaluate a novel form of pervious PET composite, called as PPC, by using plastic waste, soil and aggregates (no Portland cement or asphalt). A mix design was prepared by using different PET to soil/aggregate ratios. Using the mix designs, cylindrical samples of PPC were produced in a steel mold by compacting a mixture containing molten PET and heated aggregates and soil in accordance with proportions determined from mix design. Dry cylindrical samples of PPC were tested for indirect tensile strength and permeability. Indirect tensile strength was conducted in accordance with ASTM standard. However, permeability was conducted in a unique manner by designing and fabricating a new constant-head permeameter. Both indirect tensile strength and permeability were within the expected values found in the literature for porous pavements. Results showed that indirect tensile strength values increased with PET content. It was also found that using PET alone is not strong enough in binding aggregates and therefore, a soil/PET ratio of one was found optimum for providing maximum strength. Permeability values decreased with the decrease of A/P (aggregate/PET) ratio which in general indicates that lower PET and higher aggregate content is suitable for higher permeability. A soil/PET ratio of one was found to provide higher permeability but strength could compromise. Findings from this study indicated that developed PPC could be used for low-strength construction such as driveways, sidewalks and parking lots. PPC is a unique alternative in that it addresses two environmental issues: reducing stormwater runoff and diverting plastic waste from landfills and incinerators. As we continue our approach to sustainable and green construction materials, PPC is another step towards eco-friendly development.

THE INTERACTIONS OF SULFUR TRIOXIDE WITH WATER CLUSTERS

Presenter	Bishop, Samuel
	Undergraduate, Chemistry
Mentor	Prof. Jean Standard
Authorship	Samuel Bishop

Sulfur trioxide (SO_3) is an intermediate that is formed during the overall conversion of sulfur dioxide (SO_2) and water (H_2O) into sulfuric acid (H_2SO_4). SO_3 was placed in close proximity to water clusters varying in size from eight to twelve molecules of H_2O per cluster in order to obtain more useful data that can be used to prevent the formation of acid rain. The main purpose for this project was to look at the interactions of SO_3 with water clusters in order to obtain more data on other possible reactions that could occur besides the formation of H_2SO_4 . The results obtained have shown expected complexes to form (i.e. $\text{H}_2\text{O}-\text{SO}_3$, H_2SO_4 , $[\text{H}_3\text{O}]^+$, and $[\text{HSO}_4]^-$) as well as some rather fascinating compounds that were not expected to form (i.e. SO_2 , H_2O_2 , HSO_2-OOH , $\text{HO}-\text{SO}-\text{OOH}$, etc.). Transition states for these complexes were also found. Quantum mechanical calculations using the Gaussian software program were performed in order to obtain the complexes formed from the SO_3 and H_2O interactions. The level of theory used for these calculations was B3LYP and the basis set used for the calculations of the stable structures and transition states was 6-31G(d). These calculations also were used to obtain bond lengths, angles, and binding energies of the stable structures as well as activation energies for the transition states.

POP CULTURE FANDOMS AND KINSHIP

Presenter Bledsoe, Richard
 Undergraduate, Sociology/Anthropology

Mentor Prof. Nobuko Adachi

Pop culture and cosplay conventions like ComicCon and DragonCon have become major cultural events in the United States, cementing fandoms around particular television shows and fictional universes as real-world communities. Participants often form very close, family-like bonds among networks of friends who attend these conferences. This research asks: How and why do these fictive kinships form among participants in these conferences? What roles do these bonds play in peoples' lives?

INVESTIGATION OF OXYGEN TETHERED PYRONES TOWARD [5+2] CYCLOADDITIONS

Presenter	Bulandr, Jacob Undergraduate, Chemistry
Mentor	Prof. T. Andrew Mitchell
Authorship	Jacob Bulandr; John Goodell; T. Andrew Mitchell

[5+2] Cycloadditions are powerful reactions that allow for the construction of chiral oxygen bridged three dimensional molecules. One important factor in the intramolecular cycloaddition reaction is the placement and make-up of the tether. Additionally, results suggest that the tethered olefin electronics bear significant influence on reaction outcome. In previous studies, maltol derived carbon tethered pyrones have been synthesized and further cyclized via [5+2] cycloaddition. In the current work, kojic acid derived carbon tethered pyrones as well as oxygen containing tethered pyrones with olefin modifications were investigated to gain further understanding of the proposed mechanism of the [5+2] cycloaddition.

TEMPERATURE INFLUENCES ON THE DYNAMICS OF NEURONAL ACTIVITY

Presenter	Burek, Manuela Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Co-Mentor	Prof. Rosangela Follmann
Authorship	Epaminondas Rosa; Rosangela Follmann

Living organisms are subject to daily fluctuations in temperature. Given that these changes are often unregulated, their effect on neuronal performance is significant to many functions crucial for the survival of many species. In this study, the focus is on the influence of temperature on the transition between a tonic firing regime (steady spiking at a fixed rate) and a bursting one (sequences of spikes followed by a period of quiescence). This particular transition is of major interest, because it is associated with several functional and pathological neuronal conditions, including sleep-wake transitions and neurodegenerative disorders such as Parkinson's and Alzheimer's disease. To obtain data regarding this relationship, computer simulations were conducted using the Huber-Braun model equations which allowed for mimicking of various dynamical states with features similar to those observed in real neurons. The results show a positive relationship between temperature and the firing rate of action potentials. We also found a positive relationship between temperature and the parameter space area in which the neuron behaves in a bursting state. These results point at temperature as a possible mechanism for altering both the firing rate of neurons and the tonic-to-bursting transitions.

DOES MOTHER REALLY CALL THE SHOTS?: RAPID IN OVO AND IN VITRO METABOLISM OF TESTOSTERONE IN BIRD EGGS

Presenter	Campbell, Nicole Graduate, Biological Sciences
Mentor	Prof. Ryan Paitz
Co-Mentor	Prof. Rachel Bowden
Authorship	Nicole Campbell; Rachel Angles; Rachel Bowden; Joseph Casto; Ryan Paitz

Vertebrate embryos develop within an environment containing maternal steroid hormones that are transferred during oogenesis or gestation, which may have either transient or persistent effects during embryonic development. In egg-laying vertebrates, the amount of steroids a female transfers via yolk to the eggs she lays can vary, and this variation has been hypothesized to adaptively modify offspring phenotype. Yet, embryos are known to actively regulate their maternal steroid exposure, which raises the question: How important are maternal steroids to embryonic development? In the in ovo study, we used European starling (*Sturnus vulgaris*) eggs to examine the fate of yolk testosterone early in development. Tritiated testosterone (3H-T) was injected into freshly laid eggs which were then sampled over the first five days of incubation to characterize the movement and metabolism of 3H-T. After only 12 hours of incubation, the overwhelming majority of the 3H-T had been metabolized. Various metabolites, primarily etiocholanalone, were identified within the yolk. We then used yolk and albumen from unincubated eggs to assess 3H-T metabolism in vitro and found that the patterns of metabolism within the yolk were largely similar to those reported in the in ovo study. Given the rapid pace at which 3H-T is metabolized, both in ovo and in vitro, the extent to which maternal testosterone ever influences the embryo prior to being metabolized is unclear. The phenotypic effects of maternal testosterone may thus be mediated by the small amount of non-metabolized testosterone, the large amount of etiocholanalone produced, or both.

SYNTHESIS OF A DIVINYLIC CARBAPORPHYRIN FOR INVESTIGATIONS INTO DIELS-ALDER CYCLOADDITION REACTIONS

Presenter	Carroll, Alyssa Undergraduate, Biological Sciences
Mentor	Prof. Timothy Lash
Authorship	Alyssa Carroll; Timothy Lash

Porphyrins and related macrocycles are widely studied and show considerable promise as photosensitizers in photodynamic therapy (PDT). Dihydroporphyrins or chlorins have some advantages over porphyrins because they exhibit absorptions at wavelengths near 650 nm that can more easily penetrate bodily tissues. For instance, vertporfin (1) has been used in PDT treatments of age related macular degeneration. This drug is obtained from the Diels-Alder cycloaddition of a divinylporphyrin (protoporphyrin IX), followed by further modification. In our laboratory, porphyrin analogues with carbon atoms in place of one of the internal nitrogens (carbaporphyrins) are under investigations. In this project, the synthesis of a divinylcarbaporphyrin 2 has been developed, and it is anticipated that this system will also undergo cycloaddition reactions. Condensation of a chloroethylpyrrole 3 with 3,4-diethylpyrrole gave a tripyrrane 4a and subsequent deprotection of the terminal benzyl esters with hydrogen over Pd/C afforded the related dicarboxylic acid 4b. Acid-catalyzed condensation with an indene dialdehyde then produced a bis(2-chloroethyl)carbaporphyrin 5. It is anticipated that dehydrohalogenation will give the required divinyl compound and Diels-Alder cyclization will produce adducts such as 6, which will then be investigated.

CIGARETTE USE AMONG STUDENTS AND STAFF AT ISU DORMITORIES

Presenter	Chapman, Silas Graduate, Sociology/Anthropology
Mentor	Prof. Logan Miller
Authorship	Silas Chapman; Michael Eichstaedt; Eleanor Harvey; Jerry Huerta; Brian Keeling; David Mendez; Amanda Sergent; Alissa Williams;

Archaeology seeks to understand human culture by studying the material remains of the past. Generally, archaeology deals with eras greater than 100 years before the present. Yet, as a discipline of anthropology, the same methods and theories archaeologists apply to the past can be applied to modern contexts. Trash, whether prehistoric or modern, is the most common type of artifact archaeologists encounter, in the form of discarded objects, middens, trash pits, etc. In a modern context, cigarette butts are an extremely prolific artifact. Even in areas like Illinois State University's campus, where smoking is prohibited, cigarette butts are found on the ground. This study was part of a class, and designed to give students an opportunity to learn archaeological methods and theory through hands-on fieldwork. In doing so, the class collected smoking-related artifacts from around all three of Illinois State University's dorms. The resulting data provides insight on student and faculty behavior, including where they prefer to smoke and what types of brands and varieties are the most preferable. Not only does studying cigarette butts and related artifacts inform of current people, but can also provide models to explain past behavior.

DESIGNING NEW OXYFLUORIDE PHOSPHOR MATERIALS WITH ANTI-PEROVSKITE STRUCTURES

Presenter	Chhoeun, Justin
Mentor	Undergraduate, Chemistry
Authorship	Prof. Eirin Sullivan
	Justin Chhoeun; Eirin Sullivan

The oxyfluoride family of materials $\text{Sr}_{3-x}\text{A}_x\text{MO}_4\text{F}$ ($A = \text{Ca}, \text{Sr}, \text{Ba}$; $M = \text{Al}, \text{Ga}$) crystallize in anti-perovskite related structures. These phases are promising host lattices for new phosphors and have three crystallographically distinct sites available for incorporation of activator cations: 10-coordinate $A(1)$, 8 coordinate $A(2)$, and tetrahedrally-coordinated M . Non rare-earth activators such as In^{3+} , P^{5+} , and Bi^{3+} have been substituted on the M and $A(1)$ sites respectively to form the photoluminescent materials $\text{Sr}_{3-x}\text{Ba}_x\text{Al}_{1-c}\text{In}_c\text{O}_{4-\alpha}\text{F}_{1-\delta}$ ($0 \leq x \leq 0.6$; $0 \leq c \leq 0.2$; $0 \leq \alpha \leq 0.05$; $0 \leq \delta \leq 0.05$)^[1], $\text{Sr}_{2.5-x}\text{Ba}_{0.5}\text{Al}_{1-x}\text{P}_x\text{O}_4\text{F}$ ($0 \leq x \leq 0.15$)^[2] and $\text{Sr}_{3-x}\text{Bi}_{2x/3}\text{MO}_4\text{F}$ ($0 \leq x \leq 0.048$; $M = \text{Al}, \text{Ga}$)^[3]. All these materials absorb in the UV region of the electromagnetic spectrum and have broad emissions of visible light, with the In^{3+} -doped materials emitting in the yellow-orange region and the P^{5+} and Bi^{3+} -doped materials emitting in the blue region. This research explores the synthesis of the Ga-analog $\text{Sr}_{2.5-x}\text{Ba}_{0.5}\text{Ga}_{1-x}\text{P}_x\text{O}_4\text{F}$ ($0 \leq x \leq 0.15$) and examines the feasibility of whether the $\text{Sr}_{3-x}\text{A}_x\text{MO}_4\text{F}$ structure is amenable to co-doping of In^{3+} on the M site and Bi^{3+} on the $A(1)$ site to form phases of the composition $\text{Sr}_{2.976}\text{Bi}_{0.16}\text{M}_{1-x}\text{In}_x\text{O}_4\text{F}$ ($0 \leq x \leq 0.25$; $M = \text{Al}, \text{Ga}$). This synthetic approach aims to combine the yellow emission of In^{3+} on the M site and the blue emission of Bi^{3+} on the $A(1)$ site to produce a rare earth-free phosphor which yields an overall white light emission.

NOVEL FISCHER CARBENE CLUSTER COMPLEXES

Presenter	Chin, Colleen Graduate, Chemistry
Mentor	Prof. Lisa F. Szczepura
Authorship	Colleen Chin; Dan Huh; Wade Wilson; Lisa F. Szczepura

The research on hexarhenium selenide clusters containing organometallic ligands is limited. Our studies are aimed at expanding this area of research by exploring the coordination of isonitrile and acetylide ligands as well as their reactivity to form carbene ligands. This presentation will focus on the synthesis of Fischer carbenes coordinated to a $[\text{Re}_6\text{Se}_8]^{2+}$ cluster core. The conversion of $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(2\text{-}(\text{trimethylsiloxy})\text{phenyl isocyanide})]^+$ to the cyclic carbene product $[\text{Re}_6\text{Se}_8(\text{PEt}_3)_5(\text{N-methyl-benzoxazol-2-ylidene})]^{2+}$ will be discussed. Potential synthesis of noncyclic carbene products will also be examined. NMR data, X-ray crystallography, and Raman spectroscopy were used to characterize the products.

EXCITATION OF ELECTRODYNAMIC ANAPOLE MODE IN NANOSPHERE

Presenter	Coe, Brighton Undergraduate, Physics
Mentor	Prof. Uttam Manna
Authorship	Daniel Eggena; Uttam Manna

Resonant optical excitation of dielectric particles offers unique opportunities for future optical and nanophotonic devices because of their reduced dissipative losses and large resonant enhancement the near-fields. In this regard, the discovery of electrodynamic 'anapole mode' as non-radiating source in high index dielectric materials provides a unique playground to realize new nanophotonic devices. Under specific conditions, the superposition of internal modes can generate non-radiating states, called 'anapoles', that are free from radiative loss. Even though, the study of non-radiating objects has been part of fundamental physics for a long time, the dynamic anapole mode in the optical frequencies has only been experimentally demonstrated in 2015 in disk shaped structures. In this talk, I will explore the possibility of excitation of dynamic anapole mode in spherical structures.

THE FUTURE OF POLICING: BODY-WORN CAMERA POLICIES IN ILLINOIS

Presenter Cole, Diamond
 Graduate, Criminal Justice Sciences
Mentor Prof. Ashley Farmer

Body-worn cameras are becoming the future of policing. However, with this rise of technology, there is also a lack of body-worn camera policies around the United States, as departments learn what works with implementing uniform cameras. The use of body worn cameras is an issue that affects police-community relations, trust, and police operations, which makes the study of body cameras important. These cameras are able to record behavior by either a police officer or a citizen. Footage from body cameras can also be used as evidence in criminal and civil cases. The use of body cameras has potential to influence a change in behavior of both police officers and citizens. This paper is a content analysis that compares and contrasts body worn camera policies within the different counties in Illinois. The content analysis looks at the Illinois State body worn camera statute (50 ILCS 706/Law Enforcement Officer-Worn Body Camera Act) and compares it to the body worn camera policies of counties in Illinois, while highlighting the similarities and differences between policies to determine what departments think is most important. The purpose of this paper is to analyze these differences and emphasize the advantages and disadvantages of the various body worn camera policies in Illinois.

THE IMPACT OF GENDER FOR MENTAL HEALTH PROBATION OUTCOMES

Presenter	Corpolongo, Nick Graduate, Criminal Justice Sciences
Mentor	Prof. Phil Mulvey
Authorship	Nick Corpolongo

This research project explores the Risk/Need intake scores, recidivism, and completion rates for men and women probationers assigned to a seriously mental ill (SMI) caseload in the fourth largest county in the United States. The project will consider gender as a primary predictor of admission onto a SMI caseload as well as successful completion of SMI probation. Bivariate and multivariate statistical analyses will reveal the role that gender plays as a predictor variable for 5,000 individuals who were on the caseload between the years of 2009 and 2013 in Maricopa County (Phoenix metro region). Policy considerations for offenders with mental illness on specialty probation caseloads and gendered concerns regarding specialty probation will be discussed.

OFF-CAMPUS STUDENTS' RECYCLING HABITS AND BARRIERS TO RECYCLING

Presenter Corsolini, Summer
 Undergraduate, Health Sciences

Mentor Prof. Guang Jin

This research aimed to determine both recycling habits and barriers to recycling of off campus students at Illinois State University. An online survey was designed to collect information about demographics of the participants, their living situations and basic knowledge and opinion about recycling, and finally their accessibility to recycling. This survey was created using Google Forms and sent out to students in two ISU classes including a general education class and Facebook Group pages for two student clubs. A total of 140 volunteers participated, spanned all colleges within the university, and represented an overall response rate of 93.3%. Data was analyzed through univariate and bivariate analysis with Epi Info. and Excel. The biggest obstacle to recycling reported by students was the lack of recycling options offered nearby, with only 7.14% of participants reporting that their leasing company offers recycling in or next to their housing complex. Although only 24% of participants identify as active recyclers, the survey showed that 73.6% of participants agree that recycling is important. Because many students think recycling is important, it is likely that recycling rates would improve if there were recycling options near their residence. In fact, students are 71% more likely to be active recyclers if their leasing company offers recycling on-site. Therefore, it is recommended that leasing companies begin to offer recycling options on-site for their tenants. Additionally, participants reported that the second largest obstacle to recycling was lack of knowledge about recyclable items. To address this, there should be more education and labeling aimed at making recycling decisions easier for students.

THE EFFECT OF TOOLS ON DIFFERENT ACTOR-ARTIFACT INTERACTIONS

Presenter	Cortina, Sarai
	Undergraduate, Psychology
Mentor	Prof. Gregory Braswell
Authorship	Sarai Cortina

In much of the literature on makerspaces, there is little to no attention paid to the influence of tools on specific interactions. There is literature on the general development of tool use, such as Leeuwen, Smitsman, and Leeuwen's (1994) study which delves into how a child can use a tool to achieve a prompted goal, but there is not much on how different tools influence different types of interaction in a naturalistic environment such as a makerspace. The proposed study seeks to fill this gap by exploring the different relationships between the tools used at the Children's Discovery Museum makerspace and three different actor-artifact interaction types (child-child-artifact, child-artifact, child-adult-artifact) explored by Braswell (2012). This study also hopes to reveal whether or not certain interaction patterns are connected to the use of certain tools. Acquiring this information is important as it provides additional information that would allow us to manipulate a makerspace to serve different purposes, such as a makerspace that wants to promote child and parent cooperation. I will be using videos that show the entirety of a family's visit to the makerspace, called Innovation Station. The videos are of families working on creative projects using materials and tools provided by the museum.

SYNTHESIS OF TROPONE-FUSED PORPHYRIN

Presenter	Cramer, Emma Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Emma Cramer; Timothy Lash

Porphyrins and related systems have been widely investigated and show promising properties for applications, including as photosensitizers for photodynamic therapy. For applications of this type, the presence of long wavelength absorptions is beneficial. Recently, a carbaporphyrin structure with a fused tropolone unit was shown to have highly modified spectroscopic properties. In order to further investigate this phenomenon, porphyrin and heteroporphyrin structures with fused tropone rings have been targeted for synthesis. Base-catalyzed condensation of diethyl acetonedicarboxylate with 2,5-dimethylpyrrole-3,4-dicarbaldehyde gave a tropone-fused pyrrole 1a and subsequent reaction with lead tetraacetate afforded a diacetate derivative 1b. Further condensation with an α -unsubstituted pyrrole then gave a tripyrrane intermediate 2. Ongoing studies are being directed towards the preparation of modified porphyrin chromophores from this key intermediate.

CAN SPORTS BE CONSIDERED ART

Presenter	Dean, Krystal Undergraduate, Philosophy
Mentor	Prof. David Sanson

In this paper, it is explored whether or not Sports can be considered as Art. At first glance, sports does not seem to have a lot in common with our traditional notion of what art is. Diving deeper into the definitions of art and what we consider to be art in an abstract sense, do we start to see the overlap and similarities with sports and art. This paper attempts to include all sports as art and looks at how we can categorize different sports as different kinds of art forms. Sports such as gymnastics, basketball, and football are all looked at and considered.

LANGUAGE AND OPPRESSION: A SOCIOLINGUISTIC APPROACH TO BLUES MUSIC

Presenter	Diaz Mazquiaran, Jaione Graduate, Languages, Literatures and Cultures
Mentor	Prof. Patxi Lascurain Ibarlucea
Authorship	Jaione Diaz Mazquiaran

Sociolinguistics is the study of variation in language form and use, related to social, behavioral, situational, temporal and geographic influences. This creates differences among individuals from various backgrounds, who stick to their own sociocultural conventions. In general terms, there has always been an increasing tendency to study the relationship between language and ethnicity, being the latter one of the most common variables within sociolinguistic studies. Ethnicity could be described as a collectivity within a larger society, having a real or putative common ancestry, memories of a shared historical past, and a cultural focus on one or more symbolic elements defined as the epitome of their peoplehood.

Departing from slaves' work songs and consequent spirituals, the sociolinguistic approach to the origins of blues as a collective music genre has pathed a fascinating link between the empowering of African American Vernacular English (AAVE) and the African American identity. In fact, popular modes of expression like "hoolies" and "field hollers" gave the African-American ethnic group a sense of togetherness and inseparability. These constituted a self-authenticating poetic model, a call-and-response medium of self-expression which provided the singer with the opportunity to build an imaginary story, such as the escape towards a better life, or the mitigation of misfortunes.

Similarly, the origin of blues derives also from the spirituals, songs which exposed an overwhelming religious devotion which has often been associated with struggles for human rights, social justice and peace in the history of the United States. Additionally, these profound conformations created a discourse that represented freedom and the concept of God for the collective good in more immediate terms, which was also visible in the Blues lyrics.

In correlation to this, Charlie (or Charley) Patton (1891-1934), is considered to be the founding source of a musical lineage that runs through Johnson to the Chicago masters and on to encompass virtually everything now called Blues. Based on the corpus analysis of this eminent Mississippi Delta blues man's songs, the outcomes of this study have substantiated how blues is a formulaic composition which includes many AAVE features and is based on themes involving Afro-American communal values, conceptions and believes. This way, and from slavery onwards, it seems that the wish to escape from oppression did not only come from these people but also from their dialect which, by means of diverse oral manifestations, attempted to reveal against the more standardized English language.

ALKYNE COMBUSTION: EXPERIMENTAL AND THEORETICAL STUDIES OF FORMYL RADICAL PRODUCTION

Presenter	Drummer, Matthew Graduate, Chemistry
Mentor	Prof. Jean Standard
Authorship	Robert Quandt; Jean Standard

The formyl radical, HCO, is an important intermediate species in hydrocarbon combustion as it is a precursor to the hydroxyl radical, OH, which reacts with other abundant atmospheric species to form aerosol particles and acid rain. Under high temperature conditions, such as those in combustion reaction systems, alkanes will dehydrogenate to their corresponding alkene and alkyne forms. Computational studies have shown that oxygen atoms, O(3P), will attack at the triple bond of alkynes, leading to a complex series of reaction pathways containing many intermediate and transition state species. Previous experiments by the Quandt research group at Illinois State University have demonstrated varying intensities of HCO formation for a series of alkynes. Computational methods have been utilized by the Standard research group of Illinois State University to map out the potential energy surfaces of these alkyne + O(3P) reactions. In this work, the reactions of O(3P) with propargyl alcohol and 3-butyn-1-ol are investigated both experimentally and computationally. On the experimental front, cavity ring-down laser absorption spectroscopy (CRDLAS) was employed to detect the absorption spectrum of HCO. In order to better understand the reaction mechanisms of HCO formation in these reactions, computational methods were employed to find optimized geometries, vibrational frequencies, and potential energies of reactant, intermediate, transition state, and product structures at the M06-2x/cc-pVTZ and MP2/6-311++G(d,p) levels of theory. In addition, single-point energy calculations were carried out on the optimized molecular structures at the CCSD(T)/cc-pVTZ level of theory to construct potential energy profiles with more accurate energies. The aim of this study is to provide insight via theoretical methods that will help form a hypothesis for the variations of HCO signal intensity observed during the CRDLAS studies.

IMMUNE EXPERIENCE INTERACTS WITH HOST GENOTYPE IN ELICITING TERMINAL INVESTMENT

Presenter	Duffield, Kristin Graduate, Biological Sciences
Mentor	Prof. Scott Sakaluk
Co-Mentor	Prof. Ben Sadd
Authorship	Kristin Duffield; Kylie Hampton; Ben Sadd; Scott Sakaluk

Parasites and pathogens can have profound effects on their hosts, and infection can cause hosts to drastically alter their investment in key life history traits (e.g., defense and reproduction). Given the evidence for trade-offs between defense and reproduction, the conventional view has been that individuals faced with an infection should shift investment away from reproduction and towards defense and repair to ensure their continued survival. However, a recent review shows that infected hosts often increase investment in current reproduction, a seemingly paradoxical response that can be explained by the *terminal investment hypothesis*. This hypothesis proposes that decreased potential for future reproduction (e.g., due to infection) should favor increased investment in current reproduction. The level at which a cue of decreased survival is sufficient to trigger increased current reproductive effort (i.e. the *terminal investment threshold*) may depend on context. Specifically, genetically determined, intrinsic life history characteristics that determine temporal patterns of reproductive investment are likely to lead to genotype specific thresholds, resulting in host genotype-by-environment (infection cue) interactions for terminal investment. Using a full-factorial manipulation of genotype and simulated infection cue intensity, we investigated the terminal investment threshold in male decorated crickets (*Gryllobates sigillatus*) across genetically distinct inbred lines that varied significantly in intrinsic life history traits (e.g., daily reproductive effort, immune function, and lifespan). We quantified terminal investment thresholds in these lines by imposing a spectrum of increasing simulated infection cue intensity and measuring reproductive effort (i.e. time invested in sexual signaling) and immune function (i.e. hemocyte proliferation and lysozyme-like activity). Because of the genetic underpinnings of reproduction and defense investment (and the trade-off between these two traits), we expected distinct genetic lines to switch to a terminal investment strategy at significantly different threat levels that corresponds to their intrinsic patterns of temporal reproductive investment. We report on ongoing results of this research that address this fundamental prediction, thereby enhancing our knowledge of plastic life-history strategies and highlighting the importance of considering genotype-by-environment interactions in these assessments.

THE CULTURE OF STUFF AND THINGS: A STUDY OF MATERIAL CULTURE AND COLLECTING

Presenter	Durkin, Brianna Undergraduate, Sociology/Anthropology
Mentor	Prof. Logan Miller

Collections are inherently a huge part of our culture today in many different ways. We see them on a small scale - individual, personal collections that one might have kept as a child or even more matured collections you now keep as an adult - and we can see them on even larger scales, such as in museums, archives, and libraries. This research asks: Why are objects purposefully and systematically collected? What is the reasoning behind keeping, preserving, and sometimes displaying certain objects for an indefinite amount of time, especially when the objects have little to no functional value? How is value assigned to the objects that people deem worthy enough to collect? Finally, does this value stem from personal preferences, a unique background, or is the value monetary and once the object is included in a collection, does its value change? The research will compare professional collections at ISU's library and museums with personal collections held by students.

ON QUARK FLAVORS AND THE MUSIC OF PRIMES

Presenter	Earl, Jackson Undergraduate, Mathematics
Mentor	Prof. Lucian Ionescu
Authorship	Jackson Earl; Lucian Ionescu

Research suggests a mathematical model for quark flavor, in the context of the standard model, using algebraic number theory tools such as cyclotomic numbers as prime roots of unity. Quark flavors are instrumental in understanding elementary particles' weak decays and interactions, which are from a mathematical point of view, "just" advanced linear algebra (e.g. theory of color $SU(3)$ -representations). Primes on the other hand have a mysterious connection with Riemann zeros, sometimes called the "Music of Primes". So, is it "flavor", or "true color"?

ANALYSIS OF POTTERY AND IDENTITY AT THE NOBLE-WIETING SITE (11ML24)

Presenter Eichstaedt, Michael
 Undergraduate, Sociology/Anthropology

Mentor Prof. Logan Miller

The Illinois landscape 800 years in the past contained a variety of societies. Near present day Saint Louis was Cahokia, the largest Native American settlement in present day United States. In Southern and Central Illinois were smaller Mississippian chiefdoms, connected to the ideological/political/religious center at Cahokia. Northern Illinois contained groups which were not Mississippianized, including the Langford near present day Chicago. The level of integration of central and northern Illinois groups into the Mississippian world is uncertain.

The Noble-Wieting site is well suited to examine Langford-Mississippian relations due to its combined Langford and Mississippian occupation. Within the excavated house basin, which itself contains both Langford and Mississippian elements, there were a variety of potsherds containing both Langford grit tempered and Mississippian shell tempered pottery. The distribution of these artifacts, associated with differing ethnic groups and ideologies may reveal the interactions between the two cultures at the site. I intend to examine these two styles of pottery and their distribution throughout the excavated portion of the site. The concentrations of these differing types may reveal differing associations with Langford and Mississippian pottery. Pottery is frequently used as an indicator of identity in Mississippian archaeology. The distinctive Mississippian wares are found across sites with any degree of integration into the Mississippian world. This pottery may be used to explain the relationship between the Langford and Mississippian components of the site. Where do Langford and Mississippian potsherds concentrate? How did these identities interact with one another? What does this say about their relationship? These questions may be answered through an analysis of the Noble-Wieting pottery.

KINETIC CHARACTERIZATION OF DUPLICATED HOUSEKEEPING PROTEINS IN *SULFOLOBUS ISLANDICUS*

Presenter	Eilts, Kristen
	Graduate, Chemistry
Mentor	Prof. Chris Weitzel
Authorship	Kristen Eilts; Christopher Weitzel

The aminoacyl-tRNA synthetases (aaRSs) are fundamental to the accurate decoding of the genetic code and production of proteins. In the first step of translation, these essential “housekeeping” proteins catalyze the attachment of an amino acid to a specific transfer RNA (tRNA). This is itself a two-step process, starting with adenylation or “activation” by attaching AMP (adenosine monophosphate) to the carboxyl group of the amino acid. The “activated” amino acid is then “charged” to the 3’ end of the cognate tRNA. The charged tRNA then delivers the amino acid to the ribosome for protein synthesis. In general, each amino acid commonly found in living organisms has a dedicated aaRS. Normally, a single gene encodes each synthetase within this ancient and ubiquitous family of enzymes. However, organisms exist within an extremophile family of the Archaea kingdom that contain two distinct genes for canonical leucyl-tRNA synthetase (LeuRS). These Sulfolobaceae thrive at elevated temperatures and acidic pH, conditions typically found in the volcanic hot springs from which they are isolated. In the work presented here, we concentrate on *Sulfolobus islandicus* and its two *leuRS* homologs. We present our results of radiolabeled assays to measure the activity of LeuRS-I and LeuRS-II. Exchange assays utilizing [³²P]-labeled pyrophosphate were performed to quantify the activation of leucine by each protein. In addition, other amino acids were tested for misactivation by either protein. Aminoacylation assays were also performed utilizing [³H]-labeled leucine to measure the level of charging by each protein. As a result of the aminoacylation assays it was determined that a hypothesized zinc binding site in LeuRS-I plays an important role in augmenting catalytic activity.

PRESIDENTIAL ACCOUNTABILITY

Presenter Fernandez, Brian
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

What similarities and differences can be analyzed between President Ronald Reagan and President Donald Trump in regard to economics, foreign policy, national security, and domestic policy? Many comparisons have been made between the presidential campaigns of Reagan and Trump, however there is still room for analysis. Using the 1980 Reagan-Carter debate as well as the 2016 Trump-Clinton debate, information can be obtained to determine each president's stance on economics, foreign policy, national security, and domestic policy. Furthermore, by researching the socio-political climate of the 1980s and of 2016, an analysis of why each candidate focused on specific issues can be made. When the stances of each candidate are well-known and the socio-political climate can give context, the outcomes of each presidential election can be gauged. The first year of each presidency will serve as context for the outcomes of the promises made during their campaigns. The civic engagement aspect of this research will be to not only spread awareness, but to encourage citizens to hold politicians accountable for the promises they make while campaigning for office. Holding elected officials accountable for the promises they make is crucial for American politics, and this will be a model for objective, unbiased research and report. The point of this is to get people engaged in communicating with their community. Citizens could write to a local newspaper, journal, news outlet, or even just speak verbally to a neighbor. Also, meeting with fellow community members in a "town-hall-like" platform is a very effective method of civic engagement, which means being well-informed is of vital importance. Well-informed community members are better suited to address problems, work together, and come up with solutions to establish a better future. The key aspect for this research, is to see this done on a national level.

BLACK LIVES MATTER MOVEMENT

Presenter Fisk, Cameron
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

My research project will ask the following question: To what degree has the Black Lives Matter movement affected police arrest statistics and how has it affected police department reforms? Throughout the last several centuries we have seen that racism has been an issue especially among African Americans. Black Lives Matter movement emerged in 2013 as a response to the death of a young African American at the hands of a white police officer. This movement has helped publicize concerns of racism including racial profiling and police brutality. My project will draw from several sources including the Black Lives Matter websites and national and state level arrest statistics. I will also research police reform initiatives. I anticipate that my research will highlight the degree to which civic engagement, in the form of the Black Lives Matter movement, is positively correlated with changes in law enforcement. In addition to examining reform initiatives, I will compare 2009-2013 arrest statistics before the movement was created, to arrests between 2013-present to see what changes have occurred, and will discuss those results in light of the Black Lives Matter activities.

OPTIMIZING THE INVERSION OF A TWO LEVEL SYSTEM

Presenter	Flores, Rene Undergraduate, Physics
Mentor	Prof. Q. Su
Co-Mentor	Prof. R. Grobe
Authorship	Rene Flores; S. Dong; Q. Su; R. Grobe

We illustrate the power of optimal control theories by constructing the time dependence of an external force field that drives a simple harmonic oscillator to its largest amplitude. As one might expect the optimal force field exploits the resonance of the system. Then we apply optimal control theory to a more complicated laser-atom system. We calculate the temporal pulse shape of an external laser field that can maximize the population transfer from the ground state level of an atom to its excited state. Such a procedure may be further generalized to study the vacuum breakdown problem in which large number of two-level systems are being excited by the same laser pulse. We acknowledge support from the NSF and Research Corporation.

MICROTRANSACTIONS IN VIDEO GAMES SHOULD BE CONSIDERED CHEATING

Presenter	Foree, Katie Undergraduate, Philosophy
Mentor	Prof. David Sanson

To show that microtransactions should be considered cheating I compare established arguments used in sports that are meant to convince that certain behaviors, like steroid use, should be considered cheating. There are complications because steroid use is prohibited by the rules but microtransactions are promoted by game developers. We can still point out the ways in which they are unfair and that is worth trying to argue for.

INVASION OF SILKY BUSH CLOVER (*LESPEDEZA CUNEATA*) IN MIDWEST PRAIRIES

Presenter Fowler, Jessica
 Graduate, Biological Sciences

Mentor Prof. Victoria Borowicz

Lespedeza cuneata is a non-native legume, introduced as forage crop and cover from Japan, that forms thick, dense stands, letting very little light through. Many hypotheses explain how and why invasion by plants occur, but my research will focus on the refuge-mediated apparent competition hypothesis, which posits that a plant species can indirectly reduce growth of potential competitors, and thus invade, by providing refuge for herbivores of these surrounding plants. This hypothesis assumes that the invader is less suitable as a food resource than its neighbors. I hypothesize that *Lespedeza cuneata* indirectly competes by sheltering arthropod species that are herbivores of the surrounding plant species. This is likely because its dense stems provide better protection from predators of these herbivores and better foraging habitat. Further, *L. cuneata* is likely not a food resource of most arthropods because its foliage is chemically defended. If this hypothesis is correct, I predict: (a) higher percent herbivory on the plants surrounding *L. cuneata* than on *L. cuneata* itself, indicating it is not a food source. (b) higher abundance of arthropods in areas where *L. cuneata* is present, indicating that it provides more suitable habitat. I also predict (c) removal of *L. cuneata* in experimental plots will reduce herbivory on neighboring plants, compared to control plots. Last summer, I tested prediction (b) in a field experiment to determine how removing *L. cuneata* would affect the diversity and abundance of arthropod species. I continuously removed *L. cuneata* throughout the field season from 20 1-m² plots and left another 20 plots unmanipulated. Arthropods were collected monthly using a variety of methods including pan traps, observations, pitfall traps, and sweep nets. So far, results indicate that *Popillia japonica*, an invasive beetle, have higher numbers in plots with *L. cuneata*, supporting prediction (b). This summer I will test predictions (a) and (c) by evaluating the intensity of herbivory of plant species in plots, including *L. cuneata*, over the field season. A better understanding of the direct and indirect effects of *L. cuneata* on native communities can inform management decisions intended to limit the spread of *L. cuneata*, which could then increase arthropod and plant community diversity.

ACHIEVING SECURITY IN IOT USING IACAC (IDENTITY AUTHENTICATION AND CAPABILITY-BASED ACCESS CONTROL)

Presenter	Gandhi, Krishna Graduate, Information Technology
Mentor	Prof. Jihad Qaddour
Authorship	Krishna Gandhi; Jihad Qaddour

As per the latest trends in the information technology (IT) industry, Internet of Things (IoT) is lauded as the technology of the future. The promising trend of IoT plans to convert the existing infrastructure of electronic devices into a network structure where all physical and virtual devices are able to communicate with each-other (Diaz, Martin, & Rubio, 2016). One of the prime features of IoT is allowing ubiquitous access to the services of IoT devices and monitoring of environment using sensory data. As much of this information is sensitive personal information of users, security in IoT systems is a major concern with popularity of IoT devices (Li, Tryfonas, & Li, 2016). At present, IoT is an evolving technology with different strategies of implementation with no global standard to define the security measures and policies. Without a universally accepted standard for identity management, authentication, Authorshipization and access control, security in IoT is likely to remain a major issue and deterrent to rapid adoption of IoT. In this paper, an authentication and access control model is presented for IoT network security in form of IACAC (Identity Authentication and Capability-based Access Control) model that combines elements of performance analysis and protocol evaluation in consideration to increase security. Use of capability approach for the access control mechanism is used to protect the IoT network against denial of service, replay, and man in the middle attacks. The unique approach taken in the proposal of this solution is to integrate two most prominent aspects of network security in form of access control and authentication.

SCHOOL CLIMATE, HOPE, AND READINESS TO CHANGE: A MEDIATION MODEL

Presenter	Gallo, Ciara Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Co-Mentor	Prof. Leandra Parris
Authorship	Keeley Hynes; Daniel Lannin; Leandra Parris; Ani Yazedjian

The present study found that school climate is linked to higher levels of readiness to change for at-risk youth who participate in relationship education interventions. This relationship was mediated by hope, suggesting that a better school climate has its effect on readiness to change because of its link to hope. Implications for educational interventions for at-risk youth will be discussed.

BARNUM AND ETHNIC DISPLAY

Presenter	Gasarah, Msuur Graduate, Theatre and Dance
Mentor	Prof. Ann Haugo

In a recent musical film *The Greatest Showman*, the life of P.T. Barnum, the father of modern circus, is seen. This research will examine Barnum's representation of people of color historically, in what scholars call "ethnic display," including his relationship with these characters and how he affects their lives. In the film, Barnum makes use of people discriminated against by the society. He recruits a variety of "weird" characters that he makes complete use of. In the film, each character has something "special" to contribute and this adds to the spectacle of the show. Barnum makes these "freaks" or disabled or people of color feel they really belong to a world that they can contribute something to; he makes them feel special. However, the research will go further to compare the depiction of Barnum in the film with the known facts about Barnum's career, including his influence on the practice of ethnic display in his period. To effectively carry out this study, resources from the Circus and Allied Arts Collection will be utilized.

EQUINE OWNER BELIEFS, PERCEPTIONS, AND ATTITUDES TOWARDS INFECTIOUS DISEASE INOCULATION

Presenter	Gates, Gwendolyn Undergraduate, Agriculture
Mentor	Prof. Michelle Kibler
Co-Mentor	Prof. Janine Stone
Authorship	Gwendolyn Gates; Michelle Kibler; Janine Stone

Numerous studies have investigated the varying administration rates of annual vaccinations against equine diseases such as (e.g. - Rabies, Eastern/Western Encephalomyelitis, Equine Influenza) however, few existing studies analyze equine disease vaccination program participation. An important component to making these types of decisions at an individual level is personal preference.

These personal preferences can have consequences not only for the owner's own horse but for many other equine owners as well when infected horses come into contact with other horses. The implications of these social impacts highlight the great importance of understanding the behavior of equine owners when they are choosing to opt in or out of a vaccination program. The main objective of this study is to investigate what influences an equine owner's decision to vaccinate his/her horse. Secondary objectives include measuring how individual preferences, perceptions, and beliefs influence this decision to vaccinate (e.g. -effectiveness of vaccines, risk of exposure, moral obligation, etc.). The survey instrument will utilize a "best-worst" scaling approach to measure how attitudes towards vaccination influence the decision to vaccinate. Using this method, horse owners are given the option to choose from a smaller grouping of statements rather than an entire list (i.e., I believe, in general, that vaccines are safe; I want to protect my horse from diseases such as equine influenza and rabies; I believe it is my responsibility to help protect from the spread of diseases such as equine influenza and rabies). Individuals can then rate their agreement or disagreement within each grouping of statements.

This study will expand upon both existing and concurrent research through inquiring about numerous equine vaccines and targeting a more diversified equine industry population. Additionally, the use of a more thorough approach will yield more specific information about the reasoning behind personal equine vaccine preferences. After approval from the Institutional Review Board, an online survey will be made available through equine industry websites, such as theHorse.com and through organizations such as Illinois Arabian Horse Association. Prior to the dissemination of the survey we plan to hold focus groups to assist with finalizing the survey questions. We expect to use the results of this survey to educate equine owners. The results of this survey may also support marketing efforts and biosecurity among industry stakeholders (veterinarians, pharmaceutical companies, equine event management personnel etc.).

THE FIRST DIGIT LAW AND APPLICATIONS

Presenter	Gramm, Reid Undergraduate, Physics
Mentor	Prof. Q. Su
Co-Mentor	Prof. R. Grobe
Authorship	Reid Gramm; Jack Yost; Q. Su; R. Grobe

The first digit law or the so-called Benford's law has been important in describing the stable statistical distribution of many quantities in nature. It turns out available non-zero digits 1,2, ..., 9 do not show up as a first digit equally. Instead the stable distribution is in favor of lower valued digits than higher valued digits. In this talk we survey the Benford's law and its many interesting applications [1]. We acknowledge support from the NSF and Research Corporation.

[1] R. Gramm, J. Yost, Q. Su and R. Grobe, Phys. Rev. E 95 042136 (2017).

THIS BRIDGE CALLED THE CANARY ISLANDS: PEDAGOGICAL APPLICATIONS AND IMPLICATIONS OF MESTIZA THEORIES IN A POSTCOLONIAL SETTING

Presenter González Martín, Cristina
 Graduate, Languages, Literatures and Cultures

Mentor Prof. Venus Evans-Winters

In *Borderlands/La Frontera*, Gloria Anzaldúa constructs a unique text which does not fit in a single category, but rather resembles an Aztec-like mosaic where different genres, languages, narrative voices, and cultural elements converge. This results in a colorful patchwork where the author's personal history and the history of her people merge in a genre the author has coined as *autohistoria*. The hybridity of the formal elements in the text mirrors the in-between identity of Anzaldúa, who refers to herself as neither American nor Mexican, and both at the same time. This mestiza consciousness is not exclusive to Chicanos living in the United States, but can be extrapolated to non-American border settings. Such is the case of the Canary Islands, which are the result of the cultural and linguistic relations and exchanges between Europe, South America, and Northwestern Africa. In this paper, I will explore the pedagogical applications of mestiza theories and literary texts by feminist Latina activists and writers in the academic context of the Canary Islands. For this purpose, I will develop a methodology focused on university students who do not fully identify as European despite their Spanish nationality, not as African despite their geographical location, nor as Latinos despite their South-American Spanish accent. Even though the reception of Anzaldúa's text in Spanish universities has been discussed by scholars such as Maria Antonia Oliver-Rotger and María Henríquez-Betancor, the possibilities that such an empowering text offers to Canarian students have not been explored to date. The aim of the curriculum I propose is to help vulnerable students understand their complex identities and find their own voice when they have been silenced, so they can strive for self-determination and social justice in and outside of the classroom.

EXPLORATION OF NITROGEN-TETHERED [5+2] OXIDOPYRYLIUM-ALKENE BASED CYCLOADDITIONS

Presenter	Grabowski, Jake Undergraduate, Chemistry
Mentor	Prof. T. Andrew Mitchell
Authorship	T. Andrew Mitchell; John Goodell

[5+2] cycloadditions proceeding through oxidopyrylium-alkene intermediates are efficient means by which various bridged polycyclic ethers may be accessed. Since polycyclic ethers are common biological structures and scaffolds, further investigation into this reaction is warranted to expand available chemical space. While intermolecular [5+2] cycloadditions are generally less favorable, the inclusion of an alkene tether allows for the study of the more favorable intramolecular [5+2] cycloaddition. With the goal of developing chemo-, regio-, stereoselective [5+2] oxidopyrylium-alkene cycloadditions, various alkene-tethers were appended to Maltol-derived substrates to explore the scope and limitation of this reaction. Current work is focused on Maltol-derived substrates that include nitrogen-containing alkene tethers. These substrates were accessed by alkylation, reductive amination, and Grubbs-Hoveyda cross metathesis to produce unique Maltol-derived alkenes for impending cyclization. The resulting [5+2] cycloadditions have provided insight into the reaction pathway of this powerful reaction.

TRUST ME IT'S GOING TO BE GREAT: A MEDIA ECOLOGY ANALYSIS OF THE NEW POLITICAL CAMPAIGN

Presenter	Gustafson, Erik Graduate, Communication
Mentor	Prof. Brent Simonds

The recent proliferation and advancement of mobile technologies, specifically social media, has affected several aspects of American life, including the political campaign. First pioneered in 2008 by then candidate Barack Obama, mobile technologies evolved and proved to be integral to Donald Trump's success in the 2016 U.S. presidential campaigns. The following research applies an interdisciplinary framework that combines core tenets of media ecology with the Yale development model to track the ways in which social media affected the presidential campaigns at each phase. The study found that social media shifted communication patterns allowing candidates to create a sense of community where it did not exist before, as well as altering the significance of preexisting actors in the political realm.

IS IMMUNITY IN FEMALE CRICKETS INFLUENCED BY AN INTERACTION BETWEEN MATING AND GENOTYPE?

Presenter	Hampton, Kylie Graduate, Biological Sciences
Mentor	Prof. Scott Sakaluk
Co-Mentor	Prof. Ben Sadd
Authorship	Kylie Hampton; Kristin Duffield; Scott Sakaluk; Ben Sadd

Mating influences female immune responses across an array of insect taxa. In some species, the female immune system may respond to the components of the male ejaculate as foreign antigens, causing an alteration in immunity. In addition, males, for their own benefit, may transfer certain compounds to females that function to manipulate the balance between female immunity and reproduction. How the genotype of the ejaculate donor and the female's own genotype might interact to influence female immune responses remains unknown. The objective of this study was to determine how mating status and genotype of a female interact with the genotype of her mate to affect female immune responses. Using individuals from genetically distinct inbred lines, female decorated crickets were randomly assigned to a mating status, either mated or virgin. Experimental females from any given line were randomly paired with a male either from the same genetic line or a different genetic line. Immune function of mated and unmated females was assayed by: i) counting circulating hemocytes, ii) measuring the activity of an enzyme in the melanization immune response, phenoloxidase, and iii) assaying antibacterial activity. Preliminary data suggest that male genotype interacts with female genotype, resulting in differences in immune function between mating treatments that are contingent on genetic line. These results indicate that mating status and genotype affect female immunity in a complex manner, suggesting that female immune traits are context-dependent.

TEMPERATURE EFFECTS ON CHEMICALLY COUPLED NEURONS

Presenter	Harraman, Nathaniel Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Co-Mentor	Prof. Rosangela Follmann
Authorship	Epaminondas Rosa; Rosangela Follmann

In this presentation, we discuss the results of computer simulations mimicking the effects of reciprocal inhibitory coupling in pairs of neurons subject to varying temperatures. The neurons are connected via metabotropic synapses and for a strong enough coupling one of the neurons stops firing while the other returns to its original firing status. We study the case of two different neurons, one tonic (continued spiking at a fixed firing rate) and another bursting (sequences of spikes followed by a period of quiescence), firing at different rates and regimes, and analyze the effects of increasing temperature on their behavior. The two parameters of interest in here are coupling strength and temperature. We observe that as temperature increases, the coupling strength required to prevent one of the neurons from firing also increases. This is as expected because it is known that in general, neurons fire more rapidly at higher temperatures. The study is of relevance to the understanding of the stability of neurological systems subject to temperature changes which includes networks responsible for vital rhythmic functions such as mastication, walking and breathing.

VERTICAL SEEPAGE RATES IN THE HYPORHEIC ZONE OF A LOW GRADIENT STREAM

Presenter	Harris, Frances
	Graduate, Geography, Geology and the Environment
Mentor	Prof. Eric Peterson
Authorship	Eric Peterson

The relationship between fluid flow and heat transfer is a powerful tool used to delineate and to quantify water movement in the near-surface streambed or hyporheic zone. This study tests the viability of a heat tracing method through the characterization of one-dimensional, vertical, seepage rates in the top 150cm of the hyporheic zone of Little Kickapoo Creek (LKC). Six wells installed along the thalweg of a 25-meter stretch of the stream recorded temperature in the stream and four separate depths within the streambed from February 2009 to March 2010: 30, 60, 90, 150 cm. Stream stage was recorded in a stilling well adjacent to well 4. Seepage rates were calculated using temperature sensor pairs at depth with the one-dimensional conduction-advection-dispersion equation utilized in VFLUX. Flux is calculated at the midpoint between a sensor pair, e.g., a flux is calculated at a depth of 45cm, the midpoint between the 30cm and 60cm sensors. The dominant flux direction at a depth of 15cm is downward (negative) while the dominant flux direction at a depth of 45 cm, 75 cm, and 120 cm is upward (positive). Seepage rates at a 15 cm depth for all six wells ranges between -0.59 to 0.95 m/d with an average of -0.04 m/d. At a midpoint of 45 cm, 75 cm, and 120 cm the seepage rates are highly variable with high-frequency spikes and missing data. Due to the errors in flux, all depths below 15cm are unreliable and are not used in the remainder of this analysis. Spearman correlations for all six wells at 15 cm depth range from -0.032 to 0.369 with an average of 0.085. A positive correlation represents stage rising and the stream gaining water from the streambed and vice versa. With the assumption that flux does not have an instantaneous reaction to a change in stage, a cross-correlation analysis was performed. The cross-correlation analysis keeps stage stagnant in time, while flux is temporally shifted forward. The highest Spearman coefficient is 0.442 at well 4. The other five wells have a Spearman coefficient less than 0.20. The weak coefficients indicate that stage is not a strong control on vertical seepage rates. Flux is more likely to be controlled by the regional groundwater gradient (pressure gradient).

BULLYING AND CYBERBULLYING ON COLLEGE CAMPUSES: AN EXPLORATORY PILOT STUDY

Presenter	Hawkinson, Garrett Graduate, Psychology
Mentor	Prof. Eric Wesselmann
Co-Mentor	Prof. Leandra Parris
Authorship	Garrett Hawkinson; Eric Wesselmann; Leandra Parris

Bullying is defined as aggression towards another that includes four components: repetition, intentional, distressing, and a power differential (Olweus, 1994). Bullying has been described as physical (e.g., hitting), verbal (e.g., name calling), relational (e.g., spreading rumors), and cyber (e.g., posting hurtful comments online). Bullying unfortunately is a common experience for many children and adults and has many negative physical and psychological outcomes for victims. Research typically measures bullying within the K-12 education setting or the workplace. Information regarding college campus bullying is warranted and this information would provide insight into how young adults conceptualize and experience bullying (e.g., types of victimization, coping responses) once they leave K-12 education system and before entering the workforce.

Procedure: Two studies were conducted for the current project. The first included 212 undergraduate students in a large lecture-based course that completed open-ended and rating scales regarding the definition and frequency of bullying and cyberbullying on campus. The second study was conducted in Spring 2017 with 89 college students that explored in more detail the frequency of their own bullying and cyberbullying experiences and how undergraduate students responded to peer victimization incidents. Participants completed an adapted version of the Student Survey of Bullying Behaviors - Revised, 2nd Edition (SSBB-R2; Varjas, Henrich, & Meyers, 2009) and the Coping with Bullying Scale for Children (CBSC; Parris, 2013).

Results: Study 1 revealed that for definitions of bullying and cyberbullying, most students identified distress and humiliation as one component, that few reported power differential or repeated, and for cyberbullying participants less often identified intentionality. 47.6% of the sample reported witnessing bullying/cyberbullying during college, with 31% reporting bullying occurring more than 2-3 times a month. Study 2 indicated that students did not conceptualize bullying as verbal, relational, physical or cyber. Self-blame was reported least often as a coping strategy. Traditional and cybervictimization were uniquely predictive of the use of distancing strategies ($\beta = .025$, $p = .006$, $\beta = -.376$, $p = -.024$). Further, greater face-to-face forms of bullying was associated with more use of these strategies while cybervictimization was associated with reduced distancing.

Implications: This study provided preliminary information regarding the impact peer victimization may have on campus. Peer victimization occurs on campus and that students' perceptions of bullying does not align with the current literature and students largely distance themselves from incidents. Implications for practice, particularly on college campuses, and future research will be discussed.

A FORMATIVE EVALUATION OF RTI/MTSS IN TWO ILLINOIS SCHOOLS

Presenter	Hellmann, Emily
	Graduate, Psychology
Mentor	Prof. Mark Swerdlik
Authorship	Sarah Bartos

The researchers conducted a formative evaluation of the Response-to-Intervention (RtI)/Multi-Tiered Systems of Support (MTSS) frameworks at one elementary school and one junior high school. The purpose of this evaluation was to identify strengths and areas of improvement of the RtI/MTSS programs as well as to provide relevant recommendations.

The researchers first conducted interviews with relevant RtI/MTSS stakeholders (e.g., principals, school psychologists, academic interventionists). The information gathered in these interviews assisted in the creation of two surveys, which assessed staff and parent perceptions of the efficacy of various components of the RtI/MTSS process.

Staff ratings of the efficacy of academic (i.e. reading, writing, and mathematics) and social-emotional/behavioral interventions indicated that staff at both school found the reading intervention process is a strength at both schools, while writing and social-emotional/behavioral interventions were identified as areas of improvement. Additionally, Tier 1 interventions were generally rated as more efficacious than Tier 2 and 3 interventions at both schools.

The researchers also assessed staff perceptions of the data days and assessment process. Staff at the two schools differed in their perceptions of the efficacy of the data days process. Staff at the junior high school reported that data days was a useful part of the process. Additionally, staff at the junior high reported that the benchmarking assessment data discussed at data days was a useful for identifying students in need of intervention while the elementary school staff did not rate the district's benchmarking assessment as useful.

COMPUTATIONAL INVESTIGATIONS INTO NOVEL MECHANISMS OF SULFURIC ACID FORMATION AND ISOMERS OF SULFUR-OXYGEN MOLECULES

Presenter	Hendrix, Ben Undergraduate, Chemistry
Mentor	Prof. Jean Standard

This project encompasses three areas of interest all related by the involvement of sulfur-oxygen compounds. A high-level presentation of each is given but more in depth research on each is in progress or planned. Mechanisms for conversion of sulfur trioxide (SO_3) and water to sulfuric acid (H_2SO_4) are already known but no such work has been done involving peroxides. A mechanism involving the conversion of sulfur dioxide (SO_2), hydrogen peroxide (H_2O_2), and two or more water molecules to H_2SO_4 and remnant water molecules is demonstrated as well as similar mechanisms that vary the number and positions of water molecules. While investigating this mechanism an unusual isomer of sulfur tetroxide (SO_4) was discovered involving a cyclic O-S-O bond, which prompted a study on all possible isomers of SO_2 , SO_3 , and SO_4 as well as the transition states between them. In addition to isomers, the cyclic nature of the SO_4 molecule seemed to suggest that even larger rings could exist with more oxygen atoms. Multiple structures from SO_6 to SO_{15} were found including three five and six membered rings in some cases. All calculations were performed using the Gaussain09 software package using the Becke 3-Parameter, Lee, Yang and Parr density functional theory (B3LYP) with Dunning's correlation consistent basis set, aug-cc-pVDZ, in the gas phase.

PERCEPTIONS OF SERIAL KILLER STATUS AND THE IMPACT OF POP CULTURE CRIME DRAMAS

Presenter	Holesha, Catherine Graduate, Criminal Justice Sciences
Mentor	Prof. Jeff Walsh
Authorship	Catherine Holesha

Beginning in the 1980's serial murder began to emerge as an entrenched part of pop culture entertainment and lore. More than 40 years later and the media and entertainment industries have continued to capitalize on the public's serial murder fascination with infamous killers rising to pseudo-celebrity status. Given the popularity of television crime dramas and the frequent portrayal of serial murderers the question arises, "What affect does this pseudo-celebrity portrayal have on public perception, and does public perception differ from reality?" While there has been research into media representation, not much has been done since the early 2000's with a focus on the effects of media with regards to serial killers. With the role media plays in the public and law enforcement perception of serial killers there needs to be a comprehensive look at how serial killers are represented in popular media. This research will examine data collected from a sample of university students using an e-survey to contextualize perceptions of serial murderers including a variety of traits and characteristics. The research will be looking at perception of serial killers (i.e. demographics, intelligence, ritual, signature, and typology) compared to FBI data and Aamodt's Radford/FGCU

Serial Killer Database Research Project. Additionally, the research will examine the relationship between perceptions of serial killers and the impact of watching popular crime dramas on television that frequently depict serial murderers. This research intends to answer three key questions (1) How are people's perceptions of Serial Killer characteristics effected by media consumption (2) How do these perceptions compare to Aamodt's Radford/FGCU Serial Killer Database Research Project and (3) What are the policy and cultural implications of the celebrity status/media representations of serial killers.

THE TASTE OF CULTURE: A QUALITATIVE STUDY ON THE CULTURAL IMAGE OF FOOD

Presenter	Hoque, Afshana Parveen Graduate, Communication
Mentor	Prof. John Baldwin

The paper used an online survey to investigate whether people associate meanings to the food behaviors of other cultures, and if people's like or dislike for a particular ethnic food group impact their outlook on people belonging to that ethnicity. Open-ended questionnaires were used to gather data for the study. A total of 114 undergraduate and graduate students of a large mid-western American university participated in the study. Thematic analysis identified themes from participant's responses, guided by semiotics and social identity theory. Participants described three major food groups, Chinese, Italian, and Mexican, that they perceived as the most popular international cuisines. The themes that emerged fell into two broad categories: a) themes about the food, and b) themes about the people of that culture. The findings of the study demonstrate the importance of food-signifiers that play a central role in shaping people's perception about different food groups.

The study further indicated the presence of stereotyped opinions by participants while describing their perception about other Cultures.

DEVELOPMENT OF SYNTHETIC METHOD FOR THE PREPARATION OF SULFINATE ESTERS AND SULFINAMIDES THAT MINIMIZES THE FORMATION S-(P-TOLYL) P-TOLYLTHIOSULFONATE

Presenter	Jacobsen, Eric Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Eric Jacobsen; Shawn Hitchcock

We have recently developed a one-pot method for the synthesis of sulfinate esters via a mixed anhydride approach with p-toluenesulfonic acid and pivaloyl chloride. While the method was successful, there was always a persistent side product formation of S-(p-tolyl) p-tolylthiosulfonate. In an effort to circumvent the formation of this side-product, we launched a program focused on a more effective coupling method. To this end, we employed 3-ethyl-1-(3-dimethylaminopropyl)carbodiimide (EDC) and N,N'-dimethylaminopyridine (DMAP) in the synthesis of sulfinate esters and sulfinamides. It was determined that the order of the addition of the reagents was instrumental in determining the ratio of the product and the thiosulfonate side product.

This poster presentation will outline the beginning experiments that were employed to create the sulfinate esters and the sulfinamides, and the control studies that were investigated. The control studies included the method of preparation of the toluenesulfonic acid used, the order of addition of reagents, the induction times used in the reaction, and variation of amine substrates.

IDENTIFICATION AND ANALYSIS OF JAK-STAT PATHWAY REGULATOR GENES IN DROSOPHILA IMMUNITY

Presenter	Kadaba Ranganath, Pooja Graduate, Biological Sciences
Mentor	Prof. Nathan T. Mortimer
Authorship	Pooja K. R.; Nathan T. Mortimer

Drosophila melanogaster larvae are commonly infected by parasitoid wasps and in response, mount a robust cellular immune response against the parasitoid egg. This immune response involves fly immune cells called hemocytes and culminates in the melanotic encapsulation of the wasp egg. However, the regulations of the conserved signaling pathways controlling *D. melanogaster* immunity are not completely understood. To seek a better understanding of the regulators of one such signaling pathway, JAK-STAT, we are using an autoimmune *D. melanogaster* mutant, tumor Suzuki (tuSz). These flies have a gain of function mutation in the JAK-STAT pathway, resulting in hyperactive immune response and the encapsulation of their own fat body tissue. We have identified 7 candidate genes that we predict are involved in fly immunity and the JAK-STAT pathway. We used RNAi to knock down the candidate genes in specific hemocytes types in tuSz flies, to test their ability to modify the gain of function JAK-STAT signaling phenotype. Based on our current results, we have found that several of the candidate genes are negative regulators of the JAK-STAT pathway and that one of the candidate genes is a downstream effector of the JAK-STAT pathway, ultimately influencing the *D. melanogaster* cellular immune response. Further, we performed wasp infection studies to test our hypothesis that these candidate genes are important for the cellular encapsulation of parasitoid eggs. Our results indicate that controlled regulation of the JAK-STAT pathway is crucial in order to keep the immune response in check. Analysis of our current findings provides valuable insight into the role played by these genes in JAK-STAT pathway, an important aspect of fly immunity.

BOSSLASER RESEARCH FOR THE TECHNOLOGY & FCS DEPARTMENT

Presenter	Katz, Josh Undergraduate, Technology
Mentor	Prof. Chris Merrill

The Department of Technology bought a new 100-watt BossLaser engraver for the Technology and Engineering Education lab. While being a part of the NOYCE Scholarship and research position, my job is to discover the settings and usage of the device. Over the past semester, I learned the new program RdWorks V8 and how to operate the BossLaser. By running different types of materials at different intensities, I was able to write a friendly detailed manual for the other students in the Technology and FCS department. I tested new materials and settings within the laser and its program. Having the ability to use this technology is an opportunity no one can turn down. After writing the manual, I have been teaching other students how to operate the machine for future use. By conducting research on this topic, I can apply what I learn to my future education classes. Once I start teaching in my own classroom, adapting to similar products will come easier to me with experience. As I learn new technologies within a classroom setting, it better prepare me to teach my future students in the classroom.

THE KRAPINA NEANDERTAL SITE: USING DENTAL METRICAL ANALYSIS TO DETERMINE POPULATION VARIABILITY IN NEANDERTALS

Presenter Keeling, Brian
 Undergraduate, Sociology/Anthropology

Mentor Prof. Logan Miller

With the recent sequence of the full Neandertal genome, and with new investigations into the phylogenetic role of Neandertals, there remains a lack of new research on the position of Neandertals to each other. Modern human variation, and the relationship to each other, has been well researched for over a century. Despite this, variability still has been well researched on both primates and fossil human groups, including Neandertals. However, most of the time, this variability is tested with the lumping of Neandertal groups against a modern human population sample or against other hominins.

This research project will examine the metric variability of the Krapina dentition. Prior to this research, dental metric analysis has been used to determine the phylogenetic relationships between different organisms. Its further applicability today extends to determining sexual dimorphism, and even by aging and possibly determining sex of individuals. Dental measurements are made of two wide topics: dental metrics analysis, and dental non-metric analysis. The current trend in dental analysis is looking into the dental morphology for signs of diet, wear, and evolutionary roles. However, the present research will attempt to use metrics to determine biological units, something that non-metric analysis has yet to fully determine.

Variation has been a central topic in paleoanthropology, especially in the dentition. Scholars such as Wolpoff, Smith, and Trinkaus have questioned the dental variation and constantly sought out the meanings to these questions. These questions, such as of how hominins differ from each other, can be calculated by variation, or dispersion statistical techniques. The importance of variation is that with variation comes a reason, whether that be from a mutation in the genome, or an adaptation to an ecological niche.

For over a century, questions on the variability and discrete traits of the Krapina Neandertal's dentition have been raised. This present thesis will use the dental metric data collected by Wolpoff, and compare the breadth measurements to a modern human sample. I want to know: what does the Krapina Neandertal's dental metric variability inform on the biological relationship between the Krapina sample and other human groups, both fossil and modern, and what are the implications of these findings? Knowing if dental metric analysis can inform on the status of a Neandertal site as a biological unit can help future paleoanthropologists and bioarchaeologists in determining populations from future excavated site samples, and further understanding the Neandertal's relationship with each other.

THE ROLE OF GLOBAL GOVERNANCE IN REFUGEE EDUCATION: APPLIED THROUGH INSTITUTIONAL LIBERALISM AND DEWEYAN PRAGMATISM

Presenter Kernan, Caroline
 Graduate, Politics and Government

Mentor Prof. Michaelene Cox

The world is experiencing the worst refugee crisis since World War II, displacing millions of refugees around the world. Refugees in camps struggle to access education and humanitarian aid, leaving generations of refugees without the knowledge and skill set necessary to rebuild their lives. However, these camps must rely on the intervention of international organizations to help protect the fundamental human rights of refugees because of a lack of cooperation at the state level. The combination of institutional liberalism and Deweyan pragmatism can explain global governance's role, particularly through international organizations, such as the United Nations, in providing education in refugee camps.

RESTRUCTURING INTRODUCTORY BIOLOGY TO IMPROVE CONCEPTUAL UNDERSTANDING OF EVOLUTION

Presenter	Kew, Alex Undergraduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authorship	Rachel A. Sparks; Alex Kew; Rebekka Darner

The topic of evolution is considered to be the unifying principle in biology (Dobzhansky, 1973). Evolution is the lens through which we understand the living world, and a comprehensive understanding of evolution is necessary to understand biology and to be a scientifically literate citizen. There are gaps present in understanding of evolutionary theory in all groups of students, including undergraduate biology majors, non-majors, and high school students (Glaze & Goldston, 2015; Nehm & Reilly, 2007; Robbins & Roy, 2007). Science teachers disagree about whether it is feasible and desirable to teach evolution at all, let alone as an overarching concept in biology (Veal & Kubasko, 2003). Based on the theory of conceptual change, naïve conceptions are deeply rooted within students' conceptual frameworks. Thus, course material needs to be made relevant to students' lives in order to access their conceptual framework and produce conceptual change; however, students rarely connect evolution to their daily lives (Heddy & Sinatra, 2013). In this study, an introductory general education biology course was redesigned around six evolutionary themes with pedagogy structured according to the Teaching for Transformative Experiences in Science (TTES) model (Pugh, 2002). The TTES model is based upon the view that quality science education should be connected to students' experiences. Student scores on pre-course and post-course assessments of conceptual knowledge were analyzed using a two-factor analysis of variance in order to determine the efficacy of the TTES model in increasing student understanding of evolution and evaluate directions for future implementation of the TTES model.

ENGAGEMENT DURING RELATIONSHIP EDUCATION AND PSYCHOLOGICAL FUNCTIONING FOR AT-RISK YOUTH

Presenter	Kinnear, Kayle Graduate, Psychology
Mentor	Prof. Renée Tobin
Co-Mentor	Prof. Leandra Parris
Authorship	Kayle Kinnear; Renée Tobin; Leandra Parris; Ani Yazedjian

This study examined whether behavioral engagement during a relationship education program, Love Notes 2.1, influenced the mental health functioning of at-risk adolescents. The presentation's purpose is to provide outcome data related to the behavioral engagement of at-risk adolescents during the Love Notes 2.1 curriculum. Content will include a discussion of relationship education curricula, implementation, and study results. Benefits include better understanding of behavioral engagement and its relations to the mental health functioning of at-risk youth.

SUBSISTENCE-SETTLEMENT PATTERNS AND ENDEMICITY OF WARFARE IN ILLINOIS: VIOLENT TRAUMA AT THE LATE WOODLAND SITE OF SCHROEDER MOUNDS (11HE177)

Presenter	Klein, Joanna Undergraduate, Sociology/Anthropology
Mentor	Prof. Logan Miller
Authorship	Joanna Klein;

Intergroup violence linked with Native Americans is often placed in context with European contact. There is an abundance of evidence to refute this picture. Native Americans in prehistory were participating in war-like behaviors associated with trophy taking, including scalp-taking, dismemberment, and body part retrieval. Though there is no evidence of body part retrieval at the later Late Woodland period (AD 900-1150) site of Schroeder Mounds (11He177), there is considerable evidence of scalping and dismemberment, as well as inflicted points and blunt- and sharp-force trauma. Both healed and unhealed cases were taken into account, as the particular motives cannot be inferred. The sample size consists of a minimum of 7 adults and a maximum of 9 adults (N=56) with warfare-related violence, showing signs of sharp- and blunt-force trauma, inflicted points, scalping, and dismemberment. These cases are then compared to other sites in Illinois to infer patterns of warfare and subsistence-settlement relationships in Illinois.

DROSOPHILA LAMIN ACTS IN BOTH MOTOR NEURONS AND MUSCLE TO REGULATE LOCOMOTOR FUNCTIONS

Presenter Knoernschild, Megan
 Undergraduate, Biological Sciences

Mentor Prof. Alysia Mortimer

The nuclear lamina is the underlying matrix of cells responsible for the structure and shape of the cell. One type of intermediate filament that composes the underlying matrix is lamin. Mutations in the human lamin A/C gene are known to cause the premature aging disease Hutchinson-Gilford progeria as well as two forms of muscular dystrophy, (1) Charcot-Marie-Tooth disease which affects motor and sensory neurons, and (2) Limb-Girdle Muscular Dystrophy, which affects the muscle. By using *Drosophila* as a model, we examined to see whether possible mutations in the lamin gene would cause visible phenotypic effects that could possibly be traced back to human diseases. By targeting different tissues, we studied the locomotor behavior of the fly. In particular, we focused on altering lamin in motor neurons and muscle tissue. Targeting different tissues resulted in different effects in the ability to perform simple tasks such as walking and climbing. Visible effects such as decreased movement and decreased climbing ability were observed and the impaired movement greatly increased with age. Targeted muscle tissue had worsened phenotypic effects compared to the neural tissue. We are looking further to see how targeting other tissues will result in the negative effects in locomotive behavior.

EFFECTS OF PITCH ANGLE SCATTERING ON OBSERVATIONAL SIGNATURES OF NONLINEAR CHARGED PARTICLES DYNAMICS IN THE MAGNETOTAIL

Presenter Kovarik, Phillip
 Undergraduate, Physics
Mentor Prof. Daniel Holland

Numerical simulation of charged particles dynamics in magnetotail-like magnetic fields demonstrate the partitioning of phase space into dynamically distinct regions corresponding to transient, chaotic, and integrable orbits. In turn, this partitioning results in an ion distribution function signature that manifests itself as a series of peaks whose separation is proportional to the 4th root of the particle energy and parameters that describe the mesoscale structure of the magnetic field. The signature has been observed in quiet time satellite data from multiple different spacecrafts. We have developed an ad hoc collision operator that models pitch angle scattering due to random processes in the plasma. In our simulations we launch a uniform incoming distribution of 500,000 particles and measure the outgoing distribution. The distributions are sorted into 8 pitch angle bins (4 incoming, 4 outgoing), to model typical satellite data. We find the predicted peaks in the outgoing distribution are observable at all pitch angles and persist for small to moderate scattering amplitudes and frequencies representative of the quiet time magnetosphere. Furthermore, it is found that the underlying phase space partitioning persists. The KAM surface in the integrable region break up allowing orbits to cross boundaries that are impenetrable in the absence of noise, however the separation in trapping times between the previously integrable, the chaotic, and the transient orbits persists. The robust nature of the phase space structures helps to explain the persistence of the distribution function signature in observed satellite data.

THE IMPACT OF PARENT/TEACHER INTERACTIONS ON STUDENTS' EDUCATIONAL OUTCOMES IN SPECIAL EDUCATION PROGRAMS: A LITERATURE REVIEW

Presenter	Lanning, Brianna Undergraduate, Special Education
Mentor	Prof. Sharon Doubet
Co-Mentor	Prof. Anne Fulton
Authorship	Brianna Lanning

This study of the literature addressing parent/teacher interactions will guide pre-service teachers' understanding of the impact of relationships on student's success towards education outcomes. A thorough review of peer-reviewed journal articles, books, literature reviews, and government websites was conducted focusing on years 2000-2018. Consistent themes and results will be shared.

REARRANGEMENT OF N-METHYL PALLADIUM (II) AND RHODIUM (III) CARBAPORPHYRINS

Presenter	Latham, Alissa Graduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Alissa Latham; Timothy Lash

Benzocarbaporphyrin 1 reacted with methyl or ethyl iodide in the presence of potassium carbonate to give asymmetrical N-alkyl derivatives 2. Metalation with palladium(II) acetate afforded palladium(II) complexes where the internal alkyl groups had migrated to the inner carbon atom. In order to investigate the mechanism for this rearrangement, an alternative N-methylcarbaporphyrin 3 has been synthesized. A tripyrrane intermediate 4 was prepared by reacting N-methyl-3,4-diethylpyrrole with an acetoxymethylpyrrole and acetic acid in refluxing ethanol. Acid-catalyzed condensation of 4 with an indene dialdehyde then afforded the required carbaporphyrin 3. Subsequent metalation with palladium(II) acetate in acetonitrile gave a mixture of an N-methyl palladium(II) complex 5 and a C-methyl palladium(II) complex 6, indicating that migration of the internal alkyl group had still taken place, albeit at a slower rate. Metalation of 3 with $[\text{Rh}(\text{CO})_2\text{Cl}]_2$ afforded a metalated derivative with a methylene bridge that had also undergone a migration onto the internal carbon.

THE LEGALITY OF U.S. TARGETED KILLING OPERATIONS IN YEMEN

Presenter Leombruni, Brent
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

In its mission to win the "War on Terror," the United States military and CIA have been conducting targeted killings of suspected terrorists outside of the recognized war zone in Afghanistan for over a decade and a half. Despite the use of some of the most technologically advanced and discriminate weapons available, civilian deaths as collateral damage have been reported by the thousands. Such reports of excessive numbers of civilian deaths spur debate as to whether or not these deaths are in violation of international law. There is also the question of whether or not the U.S. has the right to use deadly force against people residing within another sovereign state - even if they are members of terrorist organizations. In order to answer these questions, it is necessary to determine which legal regime governs territories home to terror groups. The two possibilities include international humanitarian law (IHL) and international human rights law (IHRL). The former governs areas of armed conflicts and allows the loss of some civilian life as collateral damage; the latter governs all situations that fall outside of armed conflicts and prohibits the loss of civilian life as collateral damage. Using the country of Yemen as a case study, this research classifies the hostilities between the U.S. and terror groups within this country, looks at historical precedence of states engaging in war with non-state actors, and reveals potentially grave violations of international law due to the way the U.S. classifies combatants - all of which are used to determine the extent to which U.S. targeted killings in Yemen are consistent with international law.

DESIGN AND SYNTHESIS OF OXADIAZINONES AS TOOLS FOR ASYMMETRIC ORGANOCATALYSIS

Presenter	Lindvall, Tyler Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock

Since the pioneering efforts of MacMillan, and others in the field of asymmetric organocatalysis, there has been much growth in the design, synthesis, and application of structurally unique catalysts. Among these catalysts, the chiral imidazolidinones first prepared by MacMillan have proven to be successful in the asymmetric Diels-Alder cycloaddition, the vinylogous Michael-Mukaiyama reaction, the Friedel-Crafts, and other reactions. Our research program is currently focused on working with a class of heterocycles known as oxadiazinones. We have previously employed these oxadiazinones as stoichiometric chiral auxiliaries in the asymmetric aldol addition reaction, but now have an interest in steering these compounds in a new direction. These compounds are structurally related to the MacMillan oxadiazinones and may be potentially used as organocatalysts. This presentation will detail the preparation of a series of oxadiazinones derived from (1R,2S)-ephedrine through a process of reductive amination with p-anisaldehyde, N-nitrosation, lithium aluminum hydride reduction, and cyclization with triphosgene. The oxadiazinones were alkylated with a series of alkyl halides to afford N3-alkylatedoxadiazinones that can have the N4-p-methoxybenzyl substituent removed to afford the oxadiazinones that may serve as organocatalysts.

GHOST STATES IN ANALYZING ELECTRON-ATOM SCATTERING

Presenter	Lisowski, Creighton Undergraduate, Physics
Mentor	Prof. Q. Su
Co-Mentor	Prof. R. Grobe
Authorship	Richard Pelphrey; Q. Su; R. Grobe

In a quantum mechanical problem of wave packet scattering off of a static potential, the incoming wave packet is replaced by the birth of the reflected wave packet and the transmitted wave packet. In this talk we replace these three wave packets with non-interacting ghost wave packets appearing and disappearing once they enter the interaction region. We construct numerical ghost states through time reversed scattered waves. We also suggest possible temporal ghost states that may be converted during a time window. [1-2] We acknowledge support from the NSF and Research Corporation.

[1] Q.Z. Lv, S. Dong, C. Lisowski, R. Pelphrey, Y.T. Li, Q. Su and R. Grobe, Phys. Rev.

[2] C. Lisowski, S. Norris, R. Pelphrey, E. Stefanovich, Q. Su, R. Grobe, Ann. Phys. 373, 456 (2016).

CONFLICT RESOLUTION TYPES AND PERCEIVED RELATIONSHIP SATISFACTION

Presenter Lucas, Cristian
 Undergraduate, Psychology
Mentor Prof. Susan Sprecher

Past research has shown that conflict within romantic relationships can be somewhat frequent. In dating relationships, couples reported an average of 2.3 conflicts per week (Lloyd, 1987). Therefore, because of the relevance that conflict has in relationships, research on how conflict can impact relationships is important, both for advancing the scientific study of relationships and also for helping couples understand the process of relationship maintenance. One key aspect of conflict that is of interest in relationships is how couples handle conflicts that occur. Gottman (1993, 1994a, 1999) has explored the various ways that couples handle conflict within their relationships and has identified four types: validating, volatile, avoidant, and hostile. Gottman's work has shown support for the idea that validating couples have the highest relationship satisfaction whereas hostile couples tend to have the lowest satisfaction (Gottman, 1993). Based on the work of Gottman, the purpose of this study was to fill the gap in the literature in understanding how individuals perceive couples as a function of how they handle conflict.

This issue is important so that we can understand how third parties (e.g., network members) affect relationships. If people believe that certain relationships are less likely to be successful, they may react differently to them, creating a self-fulfilling prophecy. One research question guiding this research was whether people would perceive different levels of satisfaction in couples who are described with the different conflict resolution types. I hypothesized that individuals would perceive hypothetical couples with a validating conflict resolution style as the most satisfied in their relationship whereas hypothetical couples with a hostile resolution style would be perceived as the least satisfied. The current study consisted of a vignette in which participants were randomly assigned to one of four vignette conditions based on Gottman's couple conflict types. Each vignette was from the perspective of a marital therapist and included a short summary of several observations that the therapist had concerning the couple's relationship. After reading their randomly assigned vignette, participants completed a survey which asked for their reaction to the hypothetical couple through their perceptions of several factors (happiness, level of support, level of satisfaction, etc.). Results indicated that validating couples were perceived to have the highest relationship quality whereas hostile couples were perceived to have the lowest relationship quality. The results of this study could influence couples to consider adjusting their conflict type to promote a more satisfying relationship.

VARIATIONAL VS. TRANSFORMATIONAL VIEWS OF EVOLUTION IN UNDERGRADUATE WRITTEN WORK

Presenter	Martin, Julia Undergraduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authorship	Rachel A. Sparks; Julia M. Martin; Rebekka Darner

Evolution is the basis for all biological processes and is the lens through which we understand the living world, and a comprehensive understanding of evolution is necessary to understand biology and to be a scientifically literate citizen. However, there are gaps present in understanding of evolutionary theory in all groups of students, including undergraduate biology majors, non-majors, and high school students (Glaze & Goldston, 2015; Nehm & Reilly, 2007; Robbins & Roy, 2007). Students often express one of two views about evolutionary theory: variational or transformational. The more scientific perspective is variational, which shows an understanding of the roles that evolutionary mechanisms play in the change of species. A transformational view reveals a belief that change occurs through a transformation in the "essence" of the species (Shtulman, 2006).

In this study, an introductory general education biology course was redesigned around six evolutionary themes: adaptation, variation, inheritance, speciation, artificial selection, and extinction, with pedagogy structured according to the Teaching for Transformative Experiences in Science (TTES) model (Pugh, 2002). Each week, students responded to weekly reflection questions based on the selected evolutionary lens and the associated biological concept. In this poster, we present results of qualitatively coding these reflections for variational and transformational views to identify misconceptions about evolutionary theory. We suggest future analyses of this data and consider the implications of these results regarding the efficacy of the TTES model.

DEFENSIVE INTERACTIONS BETWEEN THE PARASITIC PLANT CUSCUTA PENTAGONA AND ITS HOST

Presenter	Martin, Timothy
	Graduate, Biological Sciences
Mentor	Prof. Victoria Borowicz
Authorship	Timothy Martin

Plants must respond to stimuli to grow, reproduce, and protect against enemies. To defend themselves, plants produce chemicals that reduce the likelihood of attack. Furthermore, plants can communicate by releasing volatile chemicals into the air. Because they defend themselves and communicate chemically, plants have been postulated to communicate to one another when they come under attack by herbivores. This communication may serve to prime defense responses in undamaged plants near neighbors under attack. *Cuscuta* species are non-photosynthetic, parasitic plants that rely entirely on hosts for nutrients. *Cuscuta* vines locate hosts by following volatile chemicals of potential hosts, but literature relating to the specific compounds and mechanisms used by *Cuscuta* is scant. Upon contact, *Cuscuta* develop haustoria, specialized organs that penetrate the vascular tissue of the host through which the parasite absorbs nutrients and water. Individual *Cuscuta* attach to a multitude of plants, spreading a vast network of vines to intake nutrients. Molecules besides sugars and nutritionally relevant compounds can move bidirectionally between the host plant and *Cuscuta* via haustoria. This raises the possibility that *Cuscuta* transfers defense signaling hormones among hosts. Furthermore, the biosynthesis pathways of some plant defense molecules take place partially in chloroplasts, an organelle not found in *Cuscuta*. Therefore, I hypothesize that *Cuscuta* use defense hormones synthesized in their hosts to develop their own defense. To test the hypothesis that *Cuscuta* can acquire defense molecules from its host plant, I plan to isolate, from both the host and *Cuscuta*, RNA relevant to defense pathway genes (specifically the salicylic acid or jasmonate pathways), as well as the molecules themselves. These should be induced after infestation by vascular feeding herbivores such as aphids. To determine the source of salicylic in *Cuscuta*, I would attempt to radiolabel salicylic acid in the host so that it can be distinguished from *Cuscuta*-based salicylic acid, if such genes are found to be active in *Cuscuta*. Alternatively, infesting only the *Cuscuta* while keeping the host free of herbivory, may allow for distinguishing *Cuscuta*-based salicylic acid from host-based salicylic acid. Subsequently, I would like to assess whether or not *Cuscuta* are utilizing host salicylic acid in their own defense pathways, or if the hormone is being transmitted to other plants via *Cuscuta*. Currently I am testing *Cuscuta* with five host species to see which host best supports parasitic infection.

AQUIFER CHARACTERISTICS AND GROUNDWATER SUSTAINABILITY OF DEEP BEDROCK AQUIFER SYSTEM

Presenter Martinez, Luis
Graduate, Geography, Geology and the Environment

Mentor Prof. Wondwosen Seyoum

As population continue to grow and climate change makes precipitation events less predictable, groundwater becomes an increasingly important freshwater resource. The city of Bloomington is using Lake Evergreen and Lake Bloomington as primary source of water, but the threat of drought and pollution necessitated the need for alternate sources of water. The city of Bloomington decided to install two high capacity wells into the St. Peter Sandstone aquifer to meet growing water demand. The St. Peter Sandstone aquifer is a confined aquifer, Ordovician in age that receives almost no modern recharge, is experiencing overexploitation in parts of Northern Illinois. In this study, I hypothesize that existing fast depletion of the deep St. Peter occurs due to lower-than-expected aquifer parameters of the aquifer. Further, current pumping of groundwater from the St. Peter, plus the new wells could compromise long-term sustainability. The objective of this study is to characterize the St. Peter sandstone aquifer and assess long-term sustainability with projected increases in demand. This study will model changes in the potentiometric surface of the St. Peter Sandstone aquifer using MODFLOW model in Groundwater Modeling System (GMS) to determine its long term sustainability. The model will be set up using geological and hydrogeological data collected from the Illinois State Geological Survey (ISGS) and other town/city water supply sources. Pumping rates will be determined by changes in climate, such as changes in temperature and precipitation, and by changes water demand which driven by population growth. This study of a deep aquifer system can be used to assess long-term sustainability of future well systems.

EFFECTS OF DISCOVERY ACADEMY ON MIDDLE SCHOOL FEMALES' STEM INTEREST AND CAREERS

Presenter	McClellan, Kiana Undergraduate, Biological Sciences
Mentor	Prof. Rebekka Darner
Authorship	Kara Esther Baldwin; Kiana McClellan; Rebekka Darner

Females are underrepresented in science, technology, engineering, and mathematics (STEM) occupations (Landivar, 2013). Only 20 percent of completed bachelor degrees in STEM fields are awarded to women (Hill, Corbett, & St Rose, 2010). These gaps extend into the workforce, with small percentages of women working in STEM fields, especially physics and engineering (Beeded et al., 2011; Hill, Corbett, & St Rose, 2010; Goodfield Research Group, 2002; National Science Foundation (NSF), 2014). Research on these issues within STEM focused on potential reasons for the gender gap, including: level of support for female students at the collegiate level; disinterest in STEM fields; family responsibility; implicit bias; and lack of female mentors within their field (Hill, Corbett, & St Rose, 2010; Goodfield Research Group, 2002). Discovery Academy, a two-week STEM summer camp, may provide an avenue to build female student interest in STEM. This study utilized student surveys and interviews to evaluate the impacts of a two-week camp intervention on middle school female interest in STEM and awareness of STEM careers.

SUSTAINABILITY AT ISU

Presenter	McManus, Molly Undergraduate, Sociology/Anthropology
Mentor	Prof. Logan Miller
Authorship	Molly McManus

Sustainability means being able to live in the present while meeting ones needs in everyday life without comprising the needs of everyday life for future generations. As global climate change has become a bigger issue, experts from around the world have committed to coming together in order to make our world more sustainable. The path to sustainability, while long, must start somewhere. This research examines what sustainability means at Illinois State University: Where are ordinary students getting their knowledge of sustainability? How are these students from all walks of life trying to be sustainable? What are the dining halls doing with their waste? In what ways are they being sustainable? Where is sustainability in our curriculum? What are the board members of registered student organizations committed to sustainability doing to promote the subject? What are the discourses surrounding sustainability as a whole on campus? Where on campus we are thriving and where we are falling short?

SKILL AND ATTRIBUTE DEMANDS OF AGRICULTURAL EMPLOYERS: A BEST-WORST SCALING APPROACH

Presenter	McWilliams, Joshua Graduate, Agriculture
Mentor	Prof. Michelle Kibler
Co-Mentor	Prof. Michael Barrowclough

Today's college graduates turned job candidates continue to face an increasingly competitive employment search process. Employers are searching for well-rounded job candidates who possess not only subject matter knowledge and technical skills, but also 'soft' skills (e.g. - oral/written communication, working with others, being innovative/creative). According to a recent study by the World Economic Forum, by 2020 soft skills will be in greater demand than technical skills. To better understand what soft skills are preferred in new hires, a survey was administered to agricultural employers attending the 2017 Agricultural Career Fair at Illinois State University. Institutional Review Board approval was given on August 22nd 2017(1110628-2). The primary objective of this study was to determine the skill(s) these industry professionals found to be most important in new hires. A stated choice method, "Best-Worst Scaling (BWS)", was used to elicit participant preferences towards the importance of six skills in new hires. This choice-based method has significant advantages over other survey formats (e.g., ratings scales). It allows for an individual's strength of preference for multiple objects to be calculated over a defined measurement range, providing similar information as a logistic regression model. For example, results from completed surveys (n=71) indicate that respondents found 'oral/written communication' to be the most important skill sought in new hires, approximately twice as important as 'being innovative and creative'. With these results, instructors may choose to tailor existing course activities or create new opportunities to enhance student abilities in these areas and better prepare students for employment in the highly competitive agricultural industry.

STRATEGIES FOR THE SYNTHESIS OF AZULIPORPHYRIN DIMERS

Presenter	Metallo, Mollie Graduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Mollie Metallo; Timothy Lash

Although many examples of porphyrin dimers and oligomers have been reported, little work has been carried out on the synthesis of related carbaporphyrinoid systems. In this work, the synthesis of azuliporphyrin dimers is under investigation. Specifically, azulenylporphyrin 1, biazulene 2 and 4-pyridylazulene 3 have been prepared and these intermediates are being used to prepare linked porphyrinoid structures such as 4. Azulenes 1-3 were generated by application of the Ziegler-Hafner methodology and taken on via azulitripyrrane intermediates to generate the linked porphyrinoids.

GLOBAL MOTIVATION AS A PREDICTOR OF COLLEGE STUDENTS' RATINGS OF A CAREER INTERVENTION

Presenter	Mims, Mariah Undergraduate, Psychology
Mentor	Prof. Margaret Nauta

The general purpose of the study is to find out whether or not intrinsic motivation affects the degree to which someone benefits from the Missouri Occupational Card Sort. This activity is used in career counseling to allow clients to better understand their interests with regard to choosing an occupation. The college students will first be asked to complete a pre-intervention questionnaire that includes the Global Motivation Scale (Guay, Mageau, & Vallerand, 2003). They then will complete the Missouri Occupational Card Sort. Lastly, they will answer questions regarding the extent to which they found the activity to be helpful. The findings could tell us if intrinsic motivation contributes to an individual finding the Missouri Occupational Card Sort to be useful in their career decision making process and, if so, to what extent.

THE EFFECTS OF IONIC CONDUCTANCES ON THE DYNAMICS OF NEURONAL ACTIVITY

Presenter	Mobille, Zach Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Co-Mentor	Prof. George Rutherford
Authorship	Epaminondas Rosa; George Rutherford

Neurological systems have been intriguing humans from the beginnings of civilization thousands of years ago up to this date with so many still unanswered questions. In this presentation we discuss landmark discoveries in and contributions to neuroscience. Such discoveries enabled not only precise experimental measurements and imaging of neuronal activity, but also the development of mathematical models. As a result, we have witnessed remarkable progress over the past few years in the understanding of neurological functions and disorders. Following this discussion, we focus on computational results of a single neuron Hodgkin-Huxley model to study the effects of ionic channel conductances on the neuronal firing rate. Specifically, we will test the individual and combined effects of tuning sodium, potassium, and leak channel parameters.

U.S. MILITARY INTERVENTION AND PUBLIC ENGAGEMENT

Presenter Modica, Anthony
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

What components account for the delay of public protest toward the U.S. intervention in Vietnam compared to the immediate protests against the U.S. intervention in Afghanistan? My study will examine the possible contributing factors behind this. Specifically I will be researching the differences and similarities between communication methods used by protestors and media coverage of both wars. I also will be looking into the relative economic status at the time of both wars in the U.S., as well as the public perception on the legality pertaining international law of both wars. The point of my paper is to inform others of the varying possible links to civic engagement, particularly public protests and the possible assets of immediate public response to government actions. Furthermore I will be researching polls that agreed or disagreed with our involvement in both conflicts. The number of protests along with the size of protests and the specific reasons will also be taken into account of public reaction to both conflicts. The timeline will cover the first ten years of each war.

THE WAR ON DRUGS AND ITS EFFECT ON RECIDIVISM RATES IN THE UNITED STATES

Presenter Montero, Rain
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

My study will analyze the following question: To what degree has the War on Drugs affected the recidivism rates on those convicted with drug charges? The modern War on Drugs in the United States officially began in 1971 when Richard Nixon proclaimed that the public enemy number one of America was drug abuse. This sparked a social movement that continued on late into the 1980's that called for harsher criminal penalties for drug users. Public attention to the dangers of drugs led to the passage of legislation such as the Controlled Substances Act of 1970 and the Anti-Drug Abuse Act of 1986. The Controlled Substance Act categorized drugs such as marijuana, LSD, heroin, cocaine, and ecstasy, and also imposed harsher regulations possession and sales of the substances. The Anti-Drug Abuse Act established mandatory prison sentences for certain drug offenses. This policy led federal and state prison population rates to skyrocket at an alarming rate of over 500 percent. However, critics argue that rehabilitation treatment over incarceration is a more effective method with countering drug use and recidivism rates. To analyze this argument, I will be utilizing the ideal type methodology approach in my research. This approach will be applied as I compare recidivism rates in the United States to The Netherlands. The Netherlands was chosen for the study because it has enacted decriminalization policies in regards to drug use. These policies have often been a result of public activism and ballot initiatives.

DECAY RATES FROM THE CONSTRUCTIVE STANDARD MODEL

Presenter	Moore, Annie
	Undergraduate, Physics
Mentor	Prof. N. Christensen
Authorship	S. Pinto; N. Christensen

Decay rates are normally calculated using field theory and the resulting well-known Feynman rules. However, this procedure has serious drawbacks, such as the exponential growth in the number of Feynman diagrams with the order in perturbation theory. Recently, a new approach to particle physics has been emerging that uses the so-called constructive diagrammatic rules. These constructive techniques attempt to replace Feynman diagrams and field theory, but the constructive approach is still relatively new, and many calculations have not yet been explored using its rules. In this talk, we will describe our work to calculate the scattering rate of the Z boson using the constructive method.

REEXAMINING HOMO RUDOLFENSIS: HYBRIDIZATION OR HOMO

Presenter	Moore, Logan Undergraduate, Sociology/Anthropology
Mentor	Prof. Logan Miller
Authorship	Logan Moore

Does Homo rudolfensis truly belong in the genus Homo, or should it be reclassified to a genus that better fits the characteristics that it presents? Since the discovery of this specimen there has been much debate over the classification of the species because of various reconstructions on brain size, its abnormally large face, and its large teeth among many other characteristics. If a genus is supposed to be representative of its members, why is it that Homo rudolfensis does not fit the mold? The classification of Rudolfensis is important for how paleoanthropologists define the genus Homo. More importantly, it ultimately defines what is and what not is counted as human. To that end my main research question is to reexamine the classification of the species to see if its current classification still holds up to the standards set for the genus Homo. Once the genus of Rudolfensis is decided a follow up question can be asked; is Rudolfensis not any one species but in fact a hybrid that reflects unique morphology? These questions are particularly interesting as there are many ongoing debates about hybridization in paleoanthropology. This could provide a stronger case for hybridization and allow for a better framework of what hybrid characteristics could present as.

WHEN DOES CONSISTENCY IN ROLE-DIFFERENTIATED BIMANUAL MANIPULATIONS APPEAR DURING INFANCY?

Presenter	Mordan, Leanne Undergraduate, Psychology
Mentor	Prof. Julie Campbell
Authorship	Julie Campbell

When does consistency in role-differentiated bimanual manipulations appear during infancy? According to Piaget (1952), at 1 to 4 months, infants' actions are accidental, at 4-8 months their actions become repetitive to gain environmental responses, and at 8-12 months, they become purposeful. Role-differentiated bimanual manipulations (RDBMs), are actions in which each hand performs a complimentary, but different action to perform a goal on the object. RDBMs first appear as simple actions or accidental relations between objects. The ability to perform difficult RDBMs begins to appear around 9-10 months (Babik & Michel, 2016). In the current study, we examined the consistency of performing RDBM actions across the 9- to 14- month age period. Ten infants (5 male), from 9- to 14-months were observed during a play situation. A researcher presented 32 toys to an infant and demonstrated the RDBM action before handing the toy to the infant. RDBM actions occur when infants used one hand to stabilize the object and one hand to manipulate them. No actions were coded if infants did not play with the toy or only used one hand. Videos were analyzed for the number of successful and attempted RDBMs that occurred. Successful RDBMs were defined as occurring when the expected action was performed on the object. Attempts were defined as incomplete actions (an object not completely pulled out from inside a cup, but dropped back in). A t-test will be conducted to find out if each infant performed significantly more successful RDBMs than attempted RDBMs at each month. The hypothesis is that performing a significant proportion of successful RDBMs at 9 months will predict more months overall (7 months total) in which the infant will display success at RDBM. The results of this study would support Piaget's (1952) theory that accidental actions develop into purposeful actions. Infants in this study may demonstrate a similar developmental trend if it is found that there is a significant increase in the frequency of successful RDBMs performed across infancy. The results we expect to see are that the overall number of RDBM actions in early months will predict successful RDBM's in later months. Piaget (1952) shows that 8-12 month olds actions become purposeful as they start to imitate observed behaviors of others. Babik and Michel (2016) found that RDBM actions appear around 9 months. Our study supports these theories as we expect to see consistent RDBM actions after 9 months of age.

SYNTHESIS OF AZULIPORPHYRINS FROM 2-METHYLAZULENE

Presenter	Moriones, Julian Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Julian Moriones; Timothy Lash

Azuliporphyrins **1** are carbaporphyrinoids structures that have been widely studied due to their intriguing spectroscopic and chemical properties. In this project, the effect of introducing alkyl substituents into the macrocyclic cavity is under investigation. 2-Methylazulene (**2**) has been prepared in three steps from tropolone p-toluenesulfonate and ethyl acetoacetate. Reaction of **2** with an acetoxymethylpyrrole **3** in the presence of K-10 Montmorillonite clay then gave azulitripyrrane **4** in 75% yield. Currently, the conversion of **4** into azuliporphyrin derivatives such as **5** is under review.

IMPLEMENTING A STRUCTURED NURSE TO NURSE COMMUNICATION STRATEGY

Presenter	Morris, Kathleen Graduate, Nursing
Mentor	Prof. Wendy Woith
Authorship	Kathleen Morris; Wendy Woith

Introduction: An estimated 251,000 patients die and more than one million are injured in the U.S. annually due to medical errors, and ineffective communication is a major underlying factor. Approximately 80% of serious errors occur because of poor communication between care providers during patient handoff. At one 400-bed hospital studied, there were 2.9 million nurse hand-offs annually, equating to as many opportunities for communication failures. The transfer of information from nurse to nurse during patient handoff is, therefore, a significant practice problem. Evidence demonstrates that effective handoff communication occurs with the adoption of standardized structures and processes. Furthermore, when structures and processes exist, evidence shows that patient and nurses have improved satisfaction.

Objective: The purpose of this study is to examine the effectiveness of an intervention intended to improve nurses' communication and patient satisfaction scores. **Methods:** We will use a quasi-experimental single-group pre/post-test design to test an innovative handoff tool. Potential participants will be recruited by email. Those interested will complete informed consent and the online pre-test survey. They will participate in a workshop on implementation of a handoff tool using the Situation, Background, Assessment, Recommendation (SBAR) technique to facilitate communication at handoff. Participants will then complete an online post-test survey. Research team members will round on each unit to assess use of the SBAR handoff tool. Changes in patient satisfaction will be measured using results from a standardized survey routinely sent by Press Ganey to randomly selected patients after discharge.

Results: This study is in review by the Institutional Review Board. Preliminary findings will be available in April.

Expected Results: Results of this study will guide future use of a standardized handoff tool at bedside shift report.

CO-CREATING OUR LIVES, PERFORMING OUR MULTI-CULTURAL WORLDS

Presenter Nalubowa, Aidah
 Graduate, Theatre and Dance
Mentor Prof. Ann Haugo

In his Foreword for Theatre and Migration (Cox, 2014), director Peter Sellars writes, "We are not the pictures in our passports." Neither are we the person that we look or sound like at first glance or the first meeting. Rather, who we are is shaped by among other factors our environment and cultural upbringing. Because traditionally people from different places perform and participate in different social and cultural events that are naturally "scripted" differently, we are so much more than the pictures and names we carry on our identification documents. Migration, Sellars continues, is "one of the most basic ways in which human beings complete themselves, one of the most basic ways worlds open, eyes open, and hearts open." With travel and immigration from one country to another for purposes of education, work, refuge, medical care or pleasure, people from different origins encounter and forge relationships while in transit or as they settle into their new lives. This is not easy. We blunder, dismiss people and their opinions, offend people, make friends or move on with important lessons. These interactions are further complicated by the fact that we find ourselves in a world that has for a long time survived on racial and cultural prejudice and privilege. We may have learned to approach people that are different from us with preconceived assumptions about who they are or are known to be, treating them as such without a second thought or chance. This complicates relationships that are already burdened with differences in language, beliefs, traditions, politics etc. In this era of immigration and the continuous growth of a population of "Global citizens", it is crucial that we seek and find more ways to encourage dialogue, bridge the cultural and racial gaps as our interactions become cultural exchanges, and explore ways to create new cultures from these exchanges. Globally, theatre and performance explores the human condition and challenges the participants - artists and audience members alike - to recognize and think critically about their role in creating safe spaces for equal and mutual co-existence. In my research, I propose a theatre process that encourages and recognizes participants' ideas and experiences, creates open spaces for everyone to tell their story and be who they are with pride and authority while learning and unlearning about each other, and takes as its goal the creation of new shared communities, first in theatre and possibly out into our waking lives.

CHARACTERIZATION OF A SULFOLOBUS ISLANDICUS LEUCYL-TRNA SYNTHETASE HOMOLOG KNOCKOUT STRAIN

Presenter	Newman, Ciara Undergraduate, Chemistry
Mentor	Prof. Christopher Weitzel
Authorship	Christopher Weitzel; Ciara Newman

Sulfolobus islandicus (*S. islandicus*) is a thermoacidophilic Crenarchaeon - these organisms thrive at high temperatures and low pH. Interestingly, within the *S. islandicus* genome, there are coding sequences for two leucyl-tRNA synthetase (LeuRS) homologs, designated *leuRS-F* and *leuRS-I*. Canonical LeuRS is a member of the aminoacyl-tRNA synthetases (aaRSs), a family of enzymes that catalyze the attachment of a cognate amino acid to their respective transfer RNA (tRNA), a process referred to as aminoacylation. The faithful execution of this activity is crucial to the proper translation of proteins on the ribosome. Hence, the function of this family of enzymes is crucial to the accurate decoding of the genetic code. Current results suggest that LeuRS-F's function is to fulfill a canonical role in protein translation. Curiously, LeuRS-I cannot aminoacylate tRNA^{Leu}, but maintains an ability to activate leucine with ATP, the first step in a synthetase catalytic mechanism. Therefore, further experimentation is needed to help decipher this protein's cellular function. Towards this end, a *S. islandicus leuRS-I* knockout strain was genetically engineered. We report here our characterization of this strain as compared to an isogenic wild type strain. We also present data on complementation assays utilizing an *Escherichia coli* – *S. islandicus* shuttle vector harboring the coding sequence for *leuRS-I* and *iunh*.

INVESTIGATION DIRECTED TOWARDS THE SYNTHESIS OF CARBACHLORINS

Presenter	Noboa, Mario Graduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Mario Noboa; Timothy Lash

A modified tripyrrane has been targeted as the key intermediate in the synthesis of chlorin analogues. The study of synthetically derived chlorins is of interest in both medicinal and material science, in part because they show absorptions in the red region. Although, chlorins have been widely studied, far less work has been carried out on analogous structures such as carbachlorins. In this project, a route carbachlorins is being developed. The lactone 2 was prepared from 1, using a Pd catalyst. This intermediate is used to prepare the dihydrodipyrrin 3 which was later oxidized to dihydrodipyrrin aldehyde 4. The synthesis of the key tripyrrane precursor from 4 is currently under investigation.

SHOULD STATES ADOPT DRUG OVERDOSE IMMUNITY LAWS?

Presenter Norton, Jordan
Graduate, Politics and Government
Mentor Prof. Carl Palmer

According to the CDC, there is an opioid epidemic facing America. From 2014-2015, the CDC saw a 72.2% increase in death rates related to synthetic opioids other than methadone, and a 20.6% increase in heroin related death rates. This increase occurred across all demographics, regions, and in a number of states. This issue is multifaceted, with many causes. I am going to look into one of the methods by which states are attempting to face the problem. The method I will look at is a group of laws collectively called the Drug Overdose Immunity and Good Samaritan Laws. These laws effectively allow individuals to call emergency responders in the case of an overdose without fear of prosecution. The idea behind the laws is that individuals wait too long to call response teams out of fear and that these laws would reduce or eliminate that fear, thereby reducing the number of overdose deaths. Currently, 40 states and Washington D.C. have adopted these laws state-wide. Utilizing data from the CDC and the FBI, I will look into the effectiveness of these laws. I will randomly select one group of counties from those states with the laws and one group of counties from those states without the laws. I will then look at both the drug-related death rates within each county as well as the drug-related arrest rates in each county. I will finally compare death-rates and arrest-rates between counties of those states with and without the laws. I hypothesize that I will find that the counties of those states with the Drug Overdose Immunity and Good Samaritan Laws will have lower drug-related death rates and lower drug-related arrest rates than those counties without the laws.

CHLORIDE DYNAMICS IN AN URBAN-AGRICULTURAL STREAM

Presenter	Oberhelman, Andrew Graduate, Geography, Geology and the Environment
Mentor	Prof. Eric Peterson
Authorship	Andrew Oberhelman

Freshwater quality in northern regions is threatened by salinization. Represented as rising chloride (Cl) concentration, salinization is linked to a dramatic increase in deicing salt (NaCl) application. The harmful impacts of elevated chloride levels are well documented and include freshwater acidification, mobilization of heavy metals, altered microbial communities, and degradation of water supplies. The threat posed by chloride salinization to aquatic ecosystems and anthropogenic water supplies make the study of watershed chloride dynamics imperative. While many studies have explored Cl dynamics at basin scales, few have explored the importance of stormflow to Cl load at high resolution in salt impacted streams. It is also unclear why salinization is observed in rural basins where salt application is minimal. Road salt contributes a portion, but no study has considered the role of agricultural Cl sources in salinization. This warrants a study exploring the roles of stormflow and agriculture in Cl dynamics. This study will: (1) investigate the importance of stormflow to Cl load and (2) estimate the contribution of agriculture to Cl load in an urban-agricultural stream. The study will be conducted in Sixmile Creek (SMC), which is part of an urban-agricultural watershed located in central Illinois. Two points on SMC will be sampled on a weekly basis and storms will be sampled at high resolution using an autosampler. Chemical data paired with discharge measurements will be used to calculate Cl load while ratios of Cl to Na and K will be used to assess Cl source. I predict stormflow is the main driver of Cl load and while agriculture will measurably contribute, road salt is the principal Cl load source.

THE INFLUENCE OF INTRINSIC VALUES ON COMMUNICATION AND RELATIONSHIP OUTCOMES

Presenter	O'Brien, Shannon Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Co-Mentor	Prof. Leandra Parris
Authorship	Shannon O'Brien; Daniel Lannin; Leandra Parris; Ani Yazedjian

The present study found that communication styles mediated the relationship between values and relationship outcomes in a population of at-risk adolescents. Intrinsic values may motivate the cultivation of positive relationship outcomes, whereas extrinsic values may motivate personal gains, increasing the likelihood of conflict and negative relationship outcomes.

IDENTIFYING QUANTUM INTERFERENCE EFFECTS FROM JOINT CONDUCTANCE-THERMOPOWER STATISTICS

Presenter	Olsen, Cody Undergraduate, Physics
Mentor	Prof. Justin Bergfield
Authorship	Cody Olsen; Justin Bergfield

The flow of charge and heat through molecule-based materials is dominated by quantum mechanics but complicated by the uncertainties of chemical bonding and noise. Here, we develop a statistical method to analyze joint thermopower-conductance measurement statistics of single-molecule junctions. We find that destructive quantum interference features which may be difficult to identify from either observable alone can be clearly identified from the correlations.

SOMETHING TO TALK ABOUT: IMPROVING AT-RISK YOUTH'S COMMUNICATION THROUGH RELATIONSHIP EDUCATION

Presenter	Pechtold, Alyse Undergraduate, Psychology
Mentor	Prof. Leandra Parris
Co-Mentor	Prof. Daniel Lannin
Authorship	Alyse Pechtold

Many individuals first experience dating and romantic relationships during adolescence (e.g., Chan, Adler-Baeder, Duke, Ketring, & Smith, 2016); however, many adolescents and young-adults may not have skills and information that will help them achieve healthy relationships. Therefore, during initial relationship experiences, it is important for adolescents to be in positive relationships and reduce the risk of violence or negative outcomes in the relationship (Adler-Baeder, Kerpelman, Schramm, Higginbotham, & Paulk, 2007). Relationship education encourages changes in faulty relationship beliefs, and can also help develop adaptive conflict-management skills for adolescents (e.g., Ma, Pittman, Kerpelman, & Adler-Baeder, 2014). This leads to growth in areas such as identifying faulty relationships beliefs, being more aware of unhealthy relationship patterns, and managing conflicts (e.g., Chan, Adler-Baeder, Duke, Ketring, & Smith, 2016). However, research has less often examined how adolescents' communication is affected by relationship education. We hypothesized that relationship education would result in higher levels of compromising relationship behaviors, and lower levels of attacking and avoiding behaviors.

Youth aged 15-24 in the Champaign Area Relationship Education for Youth (CARE4U) program completed surveys that were administered after parent permission and child assent were obtained. A total of 101 students participated in a semester-long relationship education program (Love Notes) during their school lunch hours, and completed pretest (August, 2016), posttest 1 (January, 2017), and posttest 2 (April, 2017) surveys assessing relationship behaviors (e.g., compromising, attacking, and avoiding). A total of 133 participants attended focus groups at posttest 1 that targeted the relationship education component of the CARE4U program. Qualitative analyses indicated that students found teaching on physiological changes, such as the release of hormones during certain phases of relationships, as among the most important and useful information. According to participants, hands-on activities and lively discussions were the most effective in facilitating their learning. Interestingly, participants indicated that they struggled sometimes when other people in their lives did not have or use the same relationship skills they had learned in CARE4U. In these instances, it was harder for participants to regulate their emotions and utilize "healthy" communication. This highlights the importance of collaborating with families to increase exposure of curricula objectives to family members, friends, and other stakeholders.

Results of quantitative analyses indicated no statistically significant effects for conflict-resolution styles from pretest to posttest 1 ($ps > .24$) or from pretest to posttest 2 ($ps > .10$). Results of this mixed-method study indicate that relationship education engages students, but that barriers to implementation of relationship skills are salient. This research suggests the need to influence students' families and larger communities, while also assessing alternative quantitative measures that capture changes in attitudes toward relationships, beliefs about healthy relationships, and relationship outcomes.

DECAY OF THE VACUUM AS A SIMPLE SCATTERING PROBLEM

Presenter	Pelphrey, Richard Undergraduate, Physics
Mentor	Prof. Q. Su
Co-Mentor	Prof. R. Grobe
Authorship	Creighton Lisowski; Q. Su; R. Grobe

The quantum field theoretical problem of the vacuum decay into electron-positron pairs induced by an external force field is mapped onto the framework of a quantum mechanical scattering process. This leads to conceptual as well as computational simplifications as the vacuum's decay rate can be obtained from the laser-assisted scattering of quantum mechanical wave packets [1-3]. We acknowledge support from the NSF and Research Corporation.

[1] Q.Z. Lv, S. Norris, R. Pelphrey, Q. Su, R. Grobe, *Comp. Phys. Comm.* 219, 1 (2017).

[2] Q.Z. Lv, S. Dong, C. Lisowski, R. Pelphrey, Y.T. Li, Q. Su and R. Grobe, *Phys. Rev.*

[3] C. Lisowski, S. Norris, R. Pelphrey, E. Stefanovich, Q. Su, R. Grobe, *Ann. Phys.* 373, 456 (2016).

SYNTHESIS AND COORDINATION CHEMISTRY OF NEW SCHIFF BASE LIGANDS WITH HYDROGEN-BONDING GROUPS

Presenter	Penn, Austin
	Graduate, Chemistry
Mentor	Prof. Christopher Hamaker

Transition metal-coordinated diimine compounds exhibit very dynamic properties such as photoactivity and potential applications in medicine. Adding a functional groups capable of hydrogen bonding to these diimine-type ligands may allow interesting and unique characteristics able to benefit both practical aspects. A series of sulfonamide- and carboxy-substituted Schiff Base ligands have been synthesized for use in metal coordination chemistry. The ligands are being characterized via ^1H NMR, ^{13}C NMR, ATR-FTIR, and X-ray crystallography. Several synthetic pathways have been developed to synthesize the Schiff Bases. These pathways make it easy to customize and tune the ligands' properties. The synthesis and characterization of the new ligands and their metal complexes will be presented.

WAVE FUNCTIONS EVOLUTION IN SPACE

Presenter	Pinto, Santiago Undergraduate, Physics
Mentor	Prof. N. Christensen
Co-Mentors	Prof. Q. Su; Prof. R. Grobe
Authorship	N.D. Christensen; J. Unger; S. Pinto; Q. Su; R. Grobe

The time-dependent Schrödinger equation is solved traditionally as an initial-time value problem, where its solution is obtained by the action of the unitary time-evolution propagator on the quantum state that is known at all spatial locations but only at $t=0$. We generalize this approach by examining the spatial evolution from a state that is, by contrast, known at all times t , but only at one specific location. As an application of the spatial propagation formalism, we introduce a spatial backtracking technique that permits us to reconstruct any quantum information about an atom from the ionization data measured at a detector outside the interaction region [1].

[1] N.D. Christensen, J. Unger, S. Pinto, Q. Su and R. Grobe, *Ann. Phys.* 389, 239 (2018).

CORRELATION OF NITRATE AND CROP COVER IN ROW-CROP AGRICULTURAL WATERSHEDS

Presenter	Piske, Jacob Graduate, Geography, Geology and the Environment
Mentor	Prof. Eric Peterson
Co-Mentor	Prof. Bill Perry
Authorship	Eric Peterson; Bill Perry

Studying long-term nitrate trends in the Mississippi River Basin (MRB) stems from the development of the hypoxic zone in the Gulf of Mexico to the changes of land use and practices that have taken place in the basin within the last century. Nitrate contamination in the MRB is considered nonpoint source pollution with the most common source coming from a combination of agricultural runoff, and the use of nitrogen fertilizers in areas adjacent to streams. In addition, land use in agricultural watersheds has undergone heavy hydrological modifications. These modifications have been occurring for decades and include channelization of the headwater streams and intensive subsurface tile drainage in fields that efficiently route water to nearby streams. Tile drainage has been in place since the 1860s and continues being replaced and expanded each year, with plastic pipes instead of the original clay pipes being used since the 1950s.

Increased use of tile drainage increases the likelihood of downstream surface water contamination from nutrients due to rapid drainage of excess water and nutrients in the soil. Intensive row-crop production of corn-soybean accounts for 90 to 95% of the landscape in the MRB with an average rate of 140lb/acre of N-fertilizers applied to corn in 2010. Less than 50 years ago, corn was grown in rotation with cereal crops and forage legumes such as alfalfa, red clover, and sweet clover with an average rate of 58lb/acre of N-fertilizers applied to corn in 1964. Farming practices began to change with the increased availability of N-fertilizers in the 1960s and 1970s, eliminating the need to incorporate legumes into a crop rotation to restore nutrients into the soil for an optimal yield. Thus, introducing row crop production of corn and soybeans that is practiced today. Using United States Geological Survey water quality data, a statistical analysis will be conducted to determine the effect of land cover changes on nitrate load in agricultural watersheds dominated by a subsurface tile-drained system over the last decade for both seasonal and annual changes. This study will focus on answering the following questions: (1) how does crop type effect nitrate loads in surface water? (2) Do nitrate loads differ between planting season and harvesting season?

STUDENT ATHLETES AND RAPE-MYTH ACCEPTANCE

Presenter	Ploss, Jessica Graduate, Criminal Justice Sciences
Mentor	Prof. Shelly Clevenger
Authorship	Jessica Ploss

This study explores data collected on student-athletes and non student-athletes in regards to how accepting they are of rape myths. The data comes from a survey that was conducted involving 624 non-athletes and 101 athletes from 21 U.S. Division I universities. The Illinois Rape Myth Acceptance scale was used to evaluate the different survey responses provided by the participants, and the researcher analyzed those responses specifically provided by the student-athletes involved in the survey to study how accepting of rape myths they were.

THE ROLE OF BOUND ELECTRONS IN THE SINGLE ELECTRON CAPTURE PROCESS

Presenter	Plumadore, Alexander Undergraduate, Physics
Mentor	Prof. Allison Harris
Authorship	Alexander Plumadore; Allison Harris

Electron capture processes play an important role in many physical systems, from fusion reactors to astrophysical processes. In an electron capture collision, an incident ion collides with a target atom, captures an electron, and leaves the collision as a bound state. Recent experimental results for $\text{He}^+ + \text{He}$ single electron capture show previously unobserved features in the differential cross section. Some of these features have been attributed to Fraunhofer diffraction effects, while others remain unexplained by theory. We present results from a fully quantum mechanical model and compare with experimental results. Using our model, we explore the effect of treating the projectile as either a single particle or a two-particle bound state. We also study the effect of the nuclear potential on the capture process.

THE ROLE OF RESOURCE SCARCITY AND ALLOCATION IN CONFLICT IN THE WEST BANK

Presenter

Quinn, Kyle
Graduate, Politics and Government

Mentor

Prof. Michaelene Cox

Since the inception of the Israeli State following the Six-Day War of 1967, Palestinians have undergone a humanitarian crisis; namely that of water scarcity and discriminatory allocation. Palestinian projects are passed at a significantly less rate than that of Israeli projects, such as the construction or rehabilitation of vital wells. Additionally, during the hotter months, water allocation to Palestinians communities in the West Bank is sharply reduced, leading to a less than viable amount of water which not only threatens their lives but also their livelihoods. Extremist organizations such as Hamas and Hezbollah prey upon these vulnerable individuals, both offering a source of income as well as a source for self-determination. Here, the role that water scarcity and allocation play on violent resistance in the West Bank will be analyzed; observing not only the conditions which lead to unrest but also how the circumstances created by the water crisis play directly into the goals of extremist organizations resulting in further acts of violence in the West Bank.

THE US STATE BUILDING IN AFGHANISTAN: AN OFFENSIVE REALIST PERSPECTIVE

Presenter Rahman, Md Mizanur
Graduate, Politics and Government

Mentor Prof. Michaelene Cox

President Donald Trump unveiled his Afghan strategy recently. Surprisingly, he became the third American president to associate with this longest-running and one of the costliest wars of the United States. Because the US administration declared its plan to continue the war against popular prediction, it is relevant to inquire: Why did US policy in Afghanistan shift from the War on Terror to state building? Why has it continued for so long? This paper investigates post-9/11 US policy in Afghanistan from the perspective of offensive realism. Particularly, it examines causes behind US policy shift in Afghanistan from War on Terror to state building, and its consistent involvement in the country for the last 17 years. The paper argues that US state building in Afghanistan is driven by two major motivations: the first is to securitize it from further terrorist attacks and to maintain order in the international system, and the second policy priority is to prevent other regional hegemony to emerge. The paper further contends that through its Afghanistan policy, the US administration maintains an onshore balance against China and offshore balance against India.

PREDICTING PERFORMANCE IN A STATISTICS COURSE: THE INCREMENTAL VALIDITY OF PERSONALITY

Presenter	Rosenberger, Erika Graduate, Psychology
Mentor	Prof. Alexandra Ilie
Co-Mentor	Prof. Dan Ispas
Authorship	Erika Rosenberger; Alexandra Ilie; Dan Ispas; Kimberly Schneider

Using cross-lagged data from 479 students enrolled in statistics courses across 4 semesters we examined the incremental validity of personality (Conscientiousness, Core Self-Evaluations and Mindsets) over ACT scores for predicting academic performance in the course (conceptualized as overall course points, exam points, and final exam). Implications for research and practice will be discussed.

EFFECT OF PH ON ANTIBODY ADSORPTION ONTO GOLD NANOPARTICLES FOR USE IN BIOSENSORS

Presenter	Ruiz, Guadalupe Undergraduate, Chemistry
Mentor	Prof. Jeremy Driskell
Authorship	Guadalupe Ruiz; Kiran Tripathi; Jeremy Driskell

Gold nanoparticles (AuNPs) functionalized with antibodies have the potential to improve biosensing technology due to the unique optical properties of AuNPs and the specificity of antibody-antigen interactions. Critical to the development and optimization of these AuNP-enabled sensing technologies is the immobilization of the antibody onto the AuNP. Ideally, antibody-AuNPs conjugates must be stable in high salt environments, and the antibody-AuNP interaction must be sufficiently strong that when exposed to biological samples, the immobilized antibody will not be replaced by the abundant matrix proteins. In this research, direct adsorption of anti-HRP antibody to AuNPs was investigated as a function of pH. Nanoparticle tracking analysis (NTA) allows our group to investigate antibody adsorption on AuNP by measuring the increase in hydrodynamic diameter (D_h) of the AuNPs at different anti-HRP concentrations. Antibody adsorption data gathered from the NTA was modeled by the Hill-modified Langmuir adsorption isotherm to determine the maximum increase in D_h at each pH. Initial experiments suggest a monolayer of antibody is formed at saturation at each pH; however, the D_h increased by 13.4 nm at pH 7.5 and the D_h increased by 8.0 nm at pH 8.5. This data may suggest that pH affects antibody orientation. Our group developed an enzyme-mediated assay to quantify the amount of antibody that is available for antigen binding to gain further insight into antibody orientation. At pH 7.50, 45% of the immobilized antibodies were active and at pH 8.5 only 14% of the immobilized antibodies were active. Based on the D_h and activity values, this data suggests that at pH 8.5 the anti-HRP is lying flat on the AuNPs and at pH 7.5 the tail portion (Fc domain) of the anti-HRP is binding to the AuNPs, allowing the antigen to bind to the anti-HRP binding site (Fab domain). Ultimately, these studies aimed to elucidate the effect of pH on antibody adsorption onto AuNP to maximize antigen-binding activity of antibody-AuNP conjugates and enhance the performance of biosensing technologies.

TEMPORAL/SPATIAL TRENDS AND CONCENTRATIONS OF MICROPLASTICS IN STREAMS THROUGHOUT THE CENTRAL ILLINOIS WATERSHEDS

Presenter Rusthoven, Ian
 Graduate, Geography, Geology and the Environment
Mentor Prof. Catherine O'Reilly
Authorship Catherine O'Reilly

Daily activities, like washing clothes, using soap, industrial cleaning use, etc., introduce potentially dangerous [OC1] microplastics into our freshwater systems. These plastic particles are defined by their size, which is <5mm in diameter. Throughout cities across the United States, local municipalities have to treat their household and industrial sewage water at WWTP's (Waste Water Treatment Plants) in order for it to be released back into the environment. In many instances, WWTP effluent has been recorded to contain microplastics. WWTP's can be seen as a mechanism where high concentrations of microplastics can be focused into our water sources. There are currently no policies or regulations requiring treatment plants to treat for microplastics. Microplastic particles have been known to carry bacteria assemblages that cause gastrointestinal infections as well as leaching PCB (polychlorinated biphenyl) which has been known to cause health risks like cancer and infertility in humans.

Due to the relatively unstudied side effects that these particles can have on humans, it is important to identify the sources of microplastics and to reduce them into our environment. Within the central Illinois watersheds there are a multitude of WWTP's.

By studying effluent from WWTP's, we can begin to understand how microplastics are derived in the treatment process. Current microplastic studies have been focused on very large urban populations like Chicago and large bodies of water like the Great Lakes. Little attention has been focused on small scale watersheds and streams within central Illinois as well as watersheds throughout the United States. By examining water samples upstream and downstream from WWTP's, I can determine if microplastics are being produced by WWTP's.

This study is not limited to the central Illinois watershed or to WWTP's, the methods used in my study can be applied to any watershed where flowing surface water is present. Do higher populated urban areas within the central Illinois watershed have a larger concentration of microplastics than less populated areas? The cities of Bloomington-Normal, Clinton, Champaign-Urbana have a population of 130,000, 7,200, and 120,000 respectively and all use WWTP's to treat household and industrial sewage.

I conclude that Bloomington-Normal will have the highest concentration of microplastics based on its higher population. This is expected since there are more people and more household sewage would have to be treated at WWTP's.

PHOTOGRAMMETRIC STRUCTURE-FROM-MOTION ANALYSIS TO UNDERSTAND EROSION OF THE ST. PETER SANDSTONE IN LASALLE COUNTY, ILLINOIS

Presenter	Rutte, Monique Graduate, Geography, Geology and the Environment
Mentor	Prof. Lisa Tranel
Authorship	Monique Rutte; Lisa Tranel

Sandstone exposures with short-term erosional features caused by human interaction and carvings in Starved Rock State Park were investigated using Structure-from-motion (SfM) to quantify present day erosion rates. Starved Rock State Park is one of the most frequently visited natural attractions in Illinois. Erosion of the tributary canyons (~50-200m deep) into the St. Peter sandstone occurred after retreat of Wisconsinian glaciers (~19,000 years ago). The interpretation is that the canyons formed related to intense outwash flood torrents. Because of the large volume of visitor traffic in the park and the nature of the sandstones, canyons are susceptible to human disturbance and natural rapid erosion. The St. Peter Sandstone is a weakly cemented, extremely friable quartz arenite, which can be easily destroyed. Using SfM techniques, a measurable quantity of human related erosion over a six-month period was obtained at two locations in Starved Rock State Park. Repeat SfM photographic data were collected from two study sites located in different canyons where canyon walls exhibit various carvings from human interaction. Data were gathered once per month for six months from each site, with 50-150 photographs taken at varying distances and angles from the canyon wall of focus. Densely collected photographs were uploaded to a computer program, Agisoft PhotoScan, which was used to produce a 3D point cloud. Following creation, point clouds were imported into CloudCompare, a software that allows for processing of 3D clouds and meshes. Analyses focused on calculations to determine distances in the form of sandstone lost from the canyon faces between point clouds, which resulted in a measurable amount of erosion on a month-month basis. Compared differences in surface topography indicated monthly changes related to erosional events, which were quantified on a millimeter-centimeter scale. This analysis provides important information regarding the short-term influence humans have on the state parks in this area and may be used to help educate the public on their lasting effects.

USE OF SUPPLEMENTARY VIDEOS IN A GENERAL EDUCATION PHYSICS COURSE TO AFFECT SCIENTIFIC REASONING SKILLS AND ATTITUDES ABOUT SCIENCE

Presenter	Sammons, Amber Undergraduate, Physics
Mentor	Prof. Rebecca Rosenblatt
Co-Mentor	Prof. Raymond Zich
Authorship	Rebecca Rosenblatt; Raymond Zich

Frequently student attitudes about science will be more negative after completing science courses than before the course. Additionally, one goal of science courses is to teach scientific reasoning skills. This study investigated the effect on both student attitudes toward science, and student scientific reasoning skills, of an instructional intervention consisting of eight 5 - 7 minute targeted videos on scientific topics. Each video consisted of an explanation of a specific concept, a hands-on demo with observations and YouTube clips highlighting the topic presented. The intervention was made more interactive by inclusion of a worksheet to be completed during the video. Questions on the worksheet tested comprehension of the concepts and the scientific reasoning employed in the video. The CLASS was used to assess student attitudes towards science, and Lawson's Scientific Reasoning Test was administered to assess student scientific reasoning skills. Analysis of data from the CLASS indicates that negative perceptions about science were reduced by up to 21%. Analysis of data from the Lawson test indicates that scientific reasoning skills increased overall by 4%, with the increase in the targeted areas increasing by 7%. This indicates that the supplementary videos were successful in improving both student attitudes toward science and students' scientific reasoning skills.

GENDER EQUALITY IN EDUCATION IN AFGHANISTAN

Presenter Sandvoss, Brittany
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

Gender inequality has been around for thousands upon thousands of years. Women have been oppressed and discriminated since the early civilizations. Its situation has gotten significantly better in developed countries in the 20th century, such as women being able to vote, obtain jobs other than maids, nurses, and seamstresses, and even get involved politically, like being a senator, congresswoman, judge, and governor. However, this is not the case in many underdeveloped countries. In Afghanistan, a poor country in the Middle East, gender inequality in education is a hot topic among the public and the government. There is a significant difference in the number of men and the number of women being educated from ages five through eighteen. This is emphasized by the fact that some findings show that the percent of literate men is more than double that of literate women in this country.

To what degree has legislation impacted the gender gap in education in Afghanistan over the last two decades and what could further be done? I will be using the network analysis approach as my research design. I will acknowledge the different barriers women face when trying to achieve education, but my main focus will be on legislation and measuring how the gender gap has been closing over the last two decades. I anticipate that my findings will show improvement in women's education based on legislation that has been passed over the last seventeen years as well as ways to further improve this gap in education between men and women.

UNDER FRIENDLY FIRE: THE INFLUENCE OF IMMUNE STATUS AND AGE ON BUMBLE BEE GUT MICROBES

Presenter	Sauers, Logan Graduate, Biological Sciences
Mentor	Prof. Ben Sadd
Authorship	Logan Sauers; Rachel Mandes; Ben Sadd

All multicellular organisms have associated microbes, known as the microbiota, which are critical for many aspects of health. It is increasingly clear that these microbial communities have intra-community interactions and intimate interactions with their hosts. Community make-up can determine multiple host phenotypes, including digestion, defense against disease, and detoxification. Host immunity can play a role in maintaining a consistent microbiota, but less is known about the potential of the innate immune system to disrupt the community and its associated function. The bumble bee gut microbiota is important for health, and has a relatively simple structure with core symbionts including *Snodgrassella alvi* and *Gilliamella apicola*. *Snodgrassella alvi* is the first adult gut colonizer, forming a biofilm, which is likely key for establishment of other microbes. *Gilliamella apicola* is a secondary colonizer with importance for digestion and parasite defense. The bee microbiota represents an accessible system to study host-microbiota interactions, but also understanding patterns of colonization and microbe community disruption has important implications for bee health. This study addressed the hypothesis that the response of hosts to encountered pathogens will result in an immune response that can disrupt the normal structure and functioning of the bee gut microbiota, and that susceptibility of the microbial community to perturbations will be greater during its establishment. The antibacterial immune response, usually targeting pathogenic microbes, was stimulated in freshly emerged or five day old adults of the bumble bee *Bombus impatiens*. Subsequently, the loads of total gut microbes and the specific community members *S. alvi* and *G. apicola* were quantified. The results demonstrate how interactions with the external biotic environment, mediating host immunity, can influence the structure and potentially subsequent functioning of beneficial microbial communities.

THE ROLE OF CLASSICAL PATHS IN THE PIQTr MODEL

Presenter	Saxton, Torrey Undergraduate, Physics
Mentor	Prof. Allison Harris
Authorship	Torrey Saxton; Zachary Temple; Allison Harris

The path integral technique is an alternative formulation of quantum mechanics that is based on a Lagrangian approach. In its exact form, it is completely equivalent to the Hamiltonian-based Schrödinger equation approach. We have used the path integral formalism to develop our Path Integral Quantum Trajectory (PIQTr) model for use in the study of charged particle dynamics. We will present results for several one-dimensional systems, and demonstrate the method's ability to analyze individual trajectories and their influence on the total probability amplitude. We will also show how the range of included trajectories can affect the time evolution of the wave function, resulting in interference fringes reminiscent of those observed with single slit Fresnel diffraction.

THERMOELECTRIC SIGNATURES OF DNA NUCLEOTIDES

Presenter	Sellers, Colin Undergraduate, Physics
Mentor	Prof. Justin Bergfield
Authorship	Colin Sellers; Justin Bergfield

We investigate the thermoelectric response of single-stranded DNA in the direction perpendicular to the backbone axis. We find that each nucleotide carries a unique thermoelectric signature due to the different electronic and chemical structure of the four bases. Our results suggest that it may be possible to sequence single-stranded DNA by scanning its length through metallic probes (e.g. a nanopore) and measuring the thermopower.

WAVE PROPAGATION OF SYNCHRONY IN COMPUTER SIMULATIONS OF NEURONAL NETWORKS

Presenter	Sellers, Colin Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Co-Mentor	Prof. Rosangela Follmann
Authorship	Epaminondas Rosa; Rosangela Follmann

Computer simulations of networks of electrically coupled neurons, reciprocally connected to their nearest neighbors with periodically boundary conditions, show waves of synchronous neurons evolving along the network. We explore different coupling scenarios as well neurons exhibiting distinct behaviors including tonic and bursting firing of action potentials, as allowed by the model equations we use for the individual neurons. Part of this study may be of relevance for the study of neuronal activity associated with epilepsy and seizures due to abnormal electrical firing in the brain.

NITROGEN AND PHOSPHORUS UPTAKE WITHIN AN URBAN STREAM ECOSYSTEM

Presenter Sheffield, Nicolette
 Graduate, Geography, Geology and the Environment
Mentor Prof. Catherine O'Reilly

Urban stream ecosystems are faced with high input levels of nitrogen (N) and phosphorus (P) from anthropogenic activities. N and P are important to plant growth and stream health; however, at high levels they can lead to algal blooms and eutrophication-a harmful effect to both stream life and water quality. Common sources of N and P within an urban setting include fertilizers, atmospheric deposition, street runoff, storm water outfall, and leaf litter decomposition. Urban stream syndrome (USS) describes the degradation of an ecosystem within an urban setting. Features such as a flashier hydrograph, altered channel stability and morphology, increase in nutrient output (such as N and P), temperature surges, and heat retention all result in an overall decrease in stream biodiversity. Not only will the environment be affected, economic services may suffer as a result. High input levels of N are seen within the Mississippi watershed basin in the form of nitrate. Focusing just on urban area outputs, 40% of N and P are emitted into the Mississippi watershed.

This study will focus on urban stream nutrient uptake through the process of nutrient spiraling along two types of stream beds: natural (possessing a defined hyporheic zone) and concrete-lined. We hypothesize that N and P uptake will be greater in a natural section of stream due to biogeochemical processes occurring in the hyporheic zone. In contrast, a concrete-lined stream bed will limit the uptake process and maintain higher concentrations, carrying N and P farther downstream. Many urban streams have been modified to manage for hydrology, which potentially alters nutrient processing by limiting interactions with the hyporheic zone. Thus, quantifying the influence of stream bed type on nutrient uptake will identify how N and P are retained within a stream ecosystem and have implications for stream system restoration.

ELICITING TRANSFORMATIVE EXPERIENCES TO INTEGRATE EVOLUTION INTO EVERYDAY THINKING

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

Evolution is the basis for all biological processes and is the lens through which we understand the living world, and a comprehensive understanding of evolution is necessary to understand biology and to be a scientifically literate citizen. Unfortunately, science teachers do not consistently teach evolution as an overarching concept, if it is taught at all (Veal & Kubasko, 2003). The theory of conceptual change asserts that naïve conceptions are deeply rooted within students' conceptual frameworks, which are shaped by prior life experiences. In order to access and potentially change these naïve conceptions, course material needs to be made relevant to students' lives, but students rarely view evolution as an important topic in their lives (Heddy & Sinatra, 2013). In this study, an introductory general education biology course was redesigned around six evolutionary themes with pedagogy structured according to the Teaching for Transformative Experiences in Science (TTES) model (Pugh, 2002). The TTES model is based upon the theory of conceptual change and uses transformative experiences to connect science content to students' lives. Transformative experiences occur when students actively use a concept in their lives, further understand an aspect of the world, and develop an appreciation for the content itself (Pugh, 2011). In order to evaluate how students applied evolutionary concepts to their daily lives, the Transformative Experience Survey (TES) was administered at the conclusion of the course. A one-sample T-test shows that after the course, students apply evolutionary theory to their lives to a moderate degree. Written responses were also qualitatively analyzed to elucidate how evolutionary theory was applied in students' everyday lives.

DO CHANGES IN DISPARITY IN THE GENDER INEQUALITY GAP CORRELATE WITH A CHANGE IN LEVELS OF CIVIC ENGAGEMENT?

Presenter Svientek, Cody
 Undergraduate, Politics and Government

Mentor Prof. Michaelene Cox

This paper explores the issue of gender inequality between two pairs of East Asian countries. It seeks to answer the following: What is the correlation between rates of civic engagement and gender disparity in China and Indonesia, and in Japan and South Korea? To what degree might civic engagement lessen gender equality in these countries? While there is variation in gender disparity gaps among countries, particularly between Western and non-Western nations, there remains some variation within the latter as well. There are a multitude of factors such as income, culture, and regime type that may contribute to the persistence of inequality in the workplace, education, politics and other arenas of the public sphere. For instance, China and Indonesia are both considered developing nations with totalitarian governments and yet are ranked higher in gender equality than Japan and South Korea which are considered more democratic regimes. This could be contributed in part to the fact that the Chinese and Indonesian governments have mandatory requirements regarding gender ratios in the workforce, and mandatory civic participation for both genders. Further, although there is a lack of significant political promotion for Chinese women due to a tightly-regulated Communist Party dominated by men, overall there has been a disregard for specific cultural norms since the revolution that disparaged women. On the other hand, Japan and South Korea lack equal pay laws and protection laws for women in the workforce, and still maintain traditional norms regarding the roles of women. This paper hypothesizes that public attention and calls for greater equality can affect positive change. It draws on statistics measuring levels of gender inequality within these four countries over time to determine if changes in disparity correspond with changes in levels of civic engagement.

POLICE MILITARIZATION: EXPLORING THE RELATIONSHIP BETWEEN 1033 LAW ENFORCEMENT AGENCIES AND THEIR JURISDICTIONS' DEMOGRAPHICS

Presenter	Taylor, Jeruel Graduate, Criminal Justice Sciences
Mentor	Prof. Ashley Farmer

Militarization continues to grow in contemporary policing. Amidst extensive coverage of recent protest, military grade equipment and strategies amongst police officers have revived discussions about paramilitary policing. Government programs, like the Department of Defense 1033 program, help fund and transfer military equipment to police departments which causes some people to believe that the lines between the military and the police are blurred. The use of paramilitary personnel units, also known as SWAT teams, has garnered national attention as well. Majority of the time SWAT deployments and raids disproportionately impact minority communities. These communities become war-zones and targets for aggressive militarized practices in the name of public safety. Nevertheless, the normalization of police militarization continues to remain. Along with exploring the historical influences of police militarization, this project uses census data and GIS crime mapping to analyze, visualize, and explore the demographics of the communities in which these paramilitary law enforcement agencies serve.

APPLICATIONS OF THE PIQTr MODEL TO TWO-DIMENSIONAL CHARGED PARTICLE SCATTERING

Presenter	Temple, Zachary Undergraduate, Physics
Mentor	Prof. Allison Harris
Authorship	Zachary Temple; Torrey Saxton; Allison Harris

Heavy-ion charged particle collisions have important applications in fields such as astrophysics, biophysics, and plasma physics, and from a fundamental standpoint, provide valuable information about the few-body problem. Current theoretical atomic collision models work well for electron projectiles, but heavy-ion projectiles continue to present a challenge for even the most advanced models. To help address these challenges, we have developed the Path Integral Quantum Trajectory (PIQTr) model for the calculation of time-dependent wave functions. The method is numerically exact and has been successfully applied to particles moving in one dimension. These results show a favorable scaling in computational requirements as the mass of the projectile increases, and in general, the model has been shown to work well for heavy ions. We have now extended our method to charged particles moving in two dimensions. Here we present time-dependent numerical results for various different charged particles and discuss applications to heavy-ion atomic collisions.

ECOLOGICAL DIFFERENCES THAT FORM GORILLA SUBSPECIES AND CONSIDERATIONS INTO WHETHER THOSE VARIATIONS ARE SIGNIFICANT ENOUGH TO RE-CLASSIFY THEM INTO SEPARATE SPECIES

Presenter	Thompson, Chelsea Undergraduate, Sociology/Anthropology
Mentor	Prof. Logan Miller

Gorillas are a unique and sometimes overlooked great ape species. The drastic differences in each subspecies is an area of study in which there is a lack of published studies and should compel more research in the subspecies. There are four known subspecies of gorilla, most of which have not been adequately observed in the wild to generate the ecological data needed for comparisons. Due to the lack of recent research into gorillas, the glance at a possible reclassification into separate species has been disregarded. The present threat to great apes has spurred recent reexamination into gorillas and other apes, therefore it is assumed that examination into ecological factors would be beneficial. Are gorilla subspecies ecologically different enough to push for a reclassification of species, or are the variants only enough for a separate population possibility?

DEVELOPMENT OF STRATEGIES FOR THE SYNTHESIS OF BENZIPORPHYRIN DIMERS

Presenter	Tomlovich, Rachel Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Rachel Tomlovich; Timothy Lash

Benziporphyrins, porphyrin analogues in which one of the pyrrole units has been replaced by a benzene ring, are an important group of compounds to study. While generally nonaromatic, electron donating groups, such as alkoxy substituents, can create some aromaticity in the structure. In this study, a route toward the synthesis of 3-alkoxybenziporphyrins using a benzitripyrrane is being developed. Alkoxy dialdehydes were synthesized by alkylating commercially available dimethyl 5-hydroxybenzene-1,3-dicarboxylate with alkylhalides. Successively reducing the product with LiAlH_4 generated the dialcohol, which was then oxidized with pyridinium chlorochromate to afford the required dialdehydes. These dialdehydes were reacted with phenylmagnesium bromide in THF to yield the dicarbinol. This dicarbinol will be transformed into a benzitripyrrane using pyrrole and boron trifluoroetherate in dichloromethane. The resulting tripyrrane will be reacted with a pyrrole dialdehyde to give a 3-alkoxybenziporphyrin. Upon successful synthesis of the 3-alkoxybenziporphyrins, this procedure will be adapted to synthesize benziporphyrin dimers that are connected by ether linkages.

IONIZATION INDUCED BY ELECTRON VORTEX BEAM

Presenter	Turpin, Victor Undergraduate, Physics
Mentor	Prof. Allison Harris
Authorship	Victor Turpin; Alexander Plumadore; Zoryana Smozhanyk; Allison Harris

Vortex beams are freely propagating beams characterized by their non-zero orbital angular momentum around the propagation direction and phase singularity at the center of the vortex. Their quantized topological structure with spiraling wave fronts has been widely studied in optical contexts, but only recently was it demonstrated that similar vortex beams could be generated with electrons. Electron vortex beams (EVBs) provide unique opportunities for the control and rotation of nanoparticles, improved resolution in electron microscopy, and many other applications. Unfortunately, very little is known about how EVBs interact with individual atoms, and there are no experimental results yet for collisions between EVBs and atoms. There is also very little theoretical work on this topic, with only a handful of studies to date for EVB collisions with hydrogen atoms. If EVBs are to be used for any of the proposed applications, it is crucial to understand how electrons with non-zero angular momentum interact with atoms on a fundamental level. We present here the first theoretical calculations for ionization collisions between electron vortex beams and simple atoms.

CONJUGATE GRADIENT METHOD FOR QUANTUM BOUND STATE

Presenter	Unger, Jonathan Undergraduate, Physics
Mentor	Prof. S. Dong
Co-Mentors	Prof. Q. Su; Prof. R. Grobe
Authorship	Jonathan Unger; Julian Jovanovich; Rene Flores; S. Dong; Q. Su; R. Grobe

We calculate a quantum mechanical ground state wave function and its energy by minimizing the total mechanical energy, as the wave function (sampled at N points in space) is being varied. Mathematically the problem can be mapped to the optimization on a N -dimensional landscape. We employ various optimization procedures such as gradient method and various conjugate gradient methods to speed up the convergence. [1-4] We acknowledge support from the NSF and Research Corporation.

[1] N.D. Christensen, J. Unger, S. Pinto, Q. Su and R. Grobe, *Ann. Phys.* 389, 239 (2018).

[2] Q.Z. Lv, J. Unger, Y.T. Li, Q. Su and R. Grobe, *Phys. Rev. A* 95, 023416 (2017).

[3] Q.Z. Lv, J. Unger, Y.T. Li, Q. Su and R. Grobe, *Euro. Phys. Lett.* 116, 40003 (2016).

[4] S. Norris, J. Unger, Q.Z. Lv, Q. Su and R. Grobe, *Phys. Rev. A* 93, 032131 (2016).

EL SURREALISMO COMPARTIDO

Presenter Velazquez, Victor
 Graduate, Languages, Literatures and Cultures

Mentor Prof. Ryan Davis

This essay will be focusing on the three most representative figures in the world of Spanish surrealism, Federico García Lorca, Salvador Dalí y Luis Buñuel. The analysis focuses mostly on the works of Lorca and Dalí, but also includes different aspects from the filmmaker Buñuel. These three artists contribute surrealist works in literature, art and film. Although Lorca, Dalí and Buñuel worked in three different mediums, they each used specific references and symbology in which connected their united vanguard vision. Amongst this group, the use of animal symbology can represent fear of death, but also can even be tied to the exploration of sexuality. Other symbols commonly used by these three artists are numbers, parts of the human body and the general use of surrealist aesthetics. This essay will look at "Poemas en prosa", "Poeta en Nueva York" and "El público" from Lorca in relationship to Dalí's "Aparición de un rostro y un frutero en la playa," "La persistencia de la memoria" and Buñuels famous short film, "El Perro Andaluz."

PRE-CRASTINATION EFFECTS IN A PROSPECTIVE MEMORY TASK

Presenter

VonderHaar, Rachel
Graduate, Psychology

Mentor

Prof. Dawn McBride

The precrastination effect is the finding that individuals complete actions earlier to "get it out of the way" (Rosenbaum, Gong, & Potts, 2014). In the current study, we tested precrastination with a prospective memory (PM) paradigm to determine if this phenomenon generalizes to PM tasks that can be completed at a time chosen by the participant. Based on Rosenbaum et al.'s (2014) results that precrastination decreased when the task to be completed was more effortful, we investigated whether difficulty of the PM task affects when participants choose to complete the task. Our results indicated that the more difficult the PM task, the later participants chose to complete the task in the trial sequence. Reaction times (RTs) in completing the ongoing task were not influenced by participants' choice of when to complete the PM task or the PM task difficulty level, but ongoing RTs decreased after completion of the PM task.

CARBODIIMIDE APPROACH TO THE SYNTHESIS OF CHIRAL ALPHA-AMINO ESTER SULFINAMIDES

Presenter	Waggoner, Stephanie Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Shawn Hitchcock

Chiral sulfinamides are useful templates for asymmetric synthesis due to their unique structure and electronic properties. Ellman's chiral auxiliary 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 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. This poster will describe our initial efforts to prepare p-tolylsulfinamides based on oxazolidinones, oxazolidine-2-thiones, and oxadiazinones using the EDC coupling method. The poster will also cover our efforts to refine the coupling method with a series of achiral amines and anilines. Finally, the poster will cover our work on the synthesis of chiral sulfinamides derived from reaction with alpha-amino esters derived from alanine, phenylalanine, and valine.

PREDICTING HOMONEGATIVITY FROM CONSERVATION VALUES AND GENDER

Presenter	Washer, Jordyn Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Authorship	Jordyn Washer; Daniel Lannin

The present research explored the relationship between personal "conservation" values, gender, and homonegativity. Results indicated that prioritizing conservation values strongly predicted greater homophobic attitudes for both men and women, with strongest effects for men. Masculine identities that value security, tradition, and conformity may be most likely to experience homonegativity.

AQUIFER SENSITIVITY ANALYSIS OF THE MAHOMET AQUIFER, GIBSON CITY QUADRANGLE, ILLINOIS

Presenter	Watson, Andrew
	Graduate, Geography, Geology and the Environment
Mentor	Prof. Eric Peterson
Authorship	Eric Peterson

The significance of the Mahomet Aquifer as a water resource for east-central Illinois prompted an analysis on the sensitivity of the aquifer to contamination. In 2015, the U.S. Environmental Protection Agency declared the Mahomet Aquifer a sole source aquifer, as there are no feasible alternative drinking water sources available for the area and contamination of the aquifer would create a significant hazard to public health. Sources of aquifer contamination in Illinois can be fertilizers and pesticides from agriculture, chloride from road salts, leakage from underground storage tanks and pipelines containing gasoline, and disposal of hazardous wastes. The goal of this study is to determine how sensitive the Mahomet Aquifer is to contamination by conducting an aquifer sensitivity analysis within the Gibson City 15' quadrangle. Aquifer sensitivity is the relative ease with which a contaminant of any kind applied on or near the land surface can migrate to an aquifer. Richard Berg's 2001 sensitivity analysis classification system will be used for this study, which determines sensitivity based on the depth from the surface to the aquifer material and the thickness of the aquifer. Berg developed six major sensitivity classifications (A-F), with sensitivity decreasing alphabetically. The six major classes were further subdivided into 24 total classifications providing detail on material, material thickness, and depth to the aquifer unit (e.g. A1-F3). To complete the assessment, a 3D geologic map will be constructed of the quadrangle using a GIS. Illinois State Geological Survey well-log data, soil survey, and LiDAR data will be imported into the GIS to delineate the subsurface layers. The 3D map will be used to help determine the depth to the aquifer material and the thickness of the aquifer material throughout the study area. These data will then allow for the assignment of the aquifer sensitivity classification values. The end result will be a 15' quadrangle map that can be used to identify areas where aquifer material is sensitive to contamination, and therefore allow for more informed land management.

RELATIONSHIP BETWEEN GENES AND DIET ON LIFESPAN IN DROSOPHILA

Presenter	Watts, Isabella Undergraduate, Biological Sciences
Mentor	Prof. Alysia Mortimer
Authorship	Isabella Watts; Alysia Vrailas-Mortimer

We are interested in how aging genes interact with environmental factors to promote lifespan. Dietary restriction has been found to extend lifespan in a variety of organism. In addition, a number of genes have also been found to increase longevity, however, how diet and these longevity genes interact to regulate lifespan is not well understood. To address this question, we use *Drosophila melanogaster* as a model because it has a relatively short lifespan and has great genetic tools that allow us to examine how changing the function of a gene influences aging. In addition, many of these aging genes are also found in humans. This makes it possible to induce a human-like disease or condition in flies to study, as an alternative to human clinical research. We found that p38 MAPK extends lifespan when over-expressed in the muscle, creating "long-lived" flies. We want to understand how different diets affect p38 MAPK mediated longevity. To do this, we are observing the lifespan of p38 MAPK over-expressed flies, along with controls, when fed different diets. We are studying three different diets: standard molasses food, nutrient-reduced Bloomington food, and nutrient-rich German food. We propose that all flies will experience the longest lifespan on Bloomington food and shortest lifespan on German food.

CORRELATION OF TWO QUANTITIES THROUGH THEIR FIRST DIGITS

Presenter	Yost, Jack Undergraduate, Physics
Mentor	Prof. Q. Su
Co-Mentor	Prof. R. Grobe
Authorship	Jack Yost; Reid Gramm; Q. Su; R. Grobe

The quasiempirical Benford law predicts that the distribution of the first significant digit of random numbers obtained from mixed probability distributions is surprisingly meaningful and reveals some universal behavior. We generalize this finding to examine the joint first-digit probability of a pair of two random numbers and show that undetectable correlations by means of the usual covariance-based measure can be identified in the statistics of the corresponding first digits. We illustrate this new measure by analyzing the correlations and anticorrelations of the positions of two interacting particles in their quantum mechanical ground state. This suggests that by using this measure, the presence or absence of correlations can be determined even if only the first digit of noisy experimental data can be measured accurately [1]. We acknowledge support from the NSF and Research Corporation.

[1] R. Gramm, J. Yost, Q. Su and R. Grobe, Phys. Rev. E 95 042136 (2017).

CITIZENS' PERCEPTIONS OF POLICE

Presenter Young, Ashley
 Graduate, Criminal Justice Sciences
Mentor Prof. Cara Rabe-Hemp

Police and society interact often and it is important that the relationship between the two are strong. The media has shown that there is a disconnect among police and citizens often resulting in citizens not respecting law enforcement. There have also been instances in the media where citizens have lost their lives at the hands of police. As researchers and as a part of society, we must ask ourselves what is the reason for the disconnect between police and society? Other factors may cause a police and citizen encounter to result in a negative or positive manner. After completing a study about factors that may influence police and citizen encounters, the perceptions that the participants had toward police interested me. Then reading how the participants felt during the encounter made me wonder if that is way their encounter unfolded as it had. The purpose of this culminating project is to compare the perceptions that students, staff, and faculty, on Illinois State University (ISU) campus, have about police on or off campus. In addition I will explore the participants' emotions during their encounters with police to determine if that may have influenced the encounter. Of the 325 responses I received from the participants via e-survey, 184 respondents shared detailed encounters of their perceptions and emotions about police. Through a content analysis and relying on other scholarly work I will address two research questions: Do students, faculty, and staff rate police differently on campus than they rate police off campus? Also, Do personal emotions that the individual, or citizen, may have influence the police and citizen encounter in a negative or positive way?

The data shows that overall we see police as legitimate and in a positive light however, our emotions can negatively impact the encounter. If a participant was stopped and felt annoyed they may have behave in a disrespectful manner or become noncompliant with police. Then there are some instances where the participants' were happy or felt safe because the police lived in their community and they saw them on a regular basis. Overall there is no major disconnect with police and society in Normal-Bloomington, Illinois however it is important to know how society views police wherever you are. Although the research is not generalizable, I think the topic is one of originality and worth being further studied to strengthen the relationship between police and society.

2018 Symposium

Afternoon Group Presentations

HOW PHYSICAL CHEMISTRY STUDENTS USE METACOGNITION TO BE SUCCESSFUL IN CLASS

Group Leader	Aiello, Nick Undergraduate, Chemistry
Group Members	Ye Jin Jang, Undergraduate, Chemistry
Mentor	Prof. Sarah B. Boesdorfer
Co-Mentor(s)	Prof. Isabel Green
Authorship	Nick Aiello; Ye Jin Jang

Metacognition is the awareness and understanding of one's own thought processes. Implementation of effective metacognitive strategies is recognized as a useful technique in classroom teaching. Students who recognize and assess their weaknesses correctly can improve their learning. Teachers are encouraged to promote metacognition in class at all age levels by asking questions, such as "which one of the homework or exam questions was the hardest for you?". Over a semester, physical chemistry students were asked metacognitive questions at the end of every homework assignment and exam. We analyzed the students' answers to these questions from the homework and correlated them with their homework and exam results. We assessed the students' identified struggles in the homework, and if then, during the exam the student still struggled, improved, or learned the topic. Also, from the exam metacognitive questions, we evaluated the students' level of metacognition for their exam performance. Our goal was to see if students accurately recognize their weaknesses or not, and if it helped them successfully learn course materials. Based on the results, we discuss the impacts that metacognition has on the students' success in the classroom and how it can be improved to enhance student learning.

THE GREEN REVOLVING FUND CHALLENGE: A CASE STUDY

Group Leader	Allen, Conner Undergraduate, Technology
Group Members	Luke Tomaszewski, Undergraduate, Technology; Frankie Galiardo, Undergraduate, Technology
Mentor	Prof. Jin Jo

In 2016, Illinois State University spent a combined 10,387,500 dollars on electricity, gas, and water. This value is projected to increase by almost 6% or 600,000 dollars. According to Illinois State University's master plan, the university must become more sustainable and efficient with its resource usage. A Green Revolving Fund (GRF) is one of the best ways to reduce resource costs and increase revenue in the long term. By designing projects and simulating return on investments, we determined how a Green Revolving Fund fits Illinois State University. By doing a comparative analysis to schools with an established GRF and similar endowment, we are able to tailor a GRF specifically to Illinois State's needs and maximize effectiveness. With a structure recommended, potential fund projects are exemplified. Utilizing past Renewable Energy capstone projects also gives us a large pool of projects to work with. We have access to hundreds of capstone research projects to bolster our simulation capacity. A financial analysis of the projects are then conducted to determine cost, benefits, and payback period. The GRF, once implemented, is extremely effective at cutting energy costs, water usage, and gas usage.

CONDUCT DISORDER SYMPTOMS WITHIN THE JUVENILE JUSTICE SYSTEM

Group Leader	Boros, Rachel Undergraduate, Psychology
Group Members	Heather Lacey, Graduate, Psychology; Danielle Gieschen, Graduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Rachel Boros; Heather Lacey; Danielle Gieschen; Brenda Huber; Renée Tobin; Adena Meyers

Conduct disorder (CD) is a prominent diagnosis among youth in juvenile justice settings, with most studies reporting prevalence greater than 80% (Cocozza & Skowrya, 2000). According to the DSM-5, CD is "a repetitive and persistent pattern of behavior in which the basic rights of others, or major age appropriate societal norms, are violated" (American Psychiatric Association, 2013. p. 469). This study examined patterns of criminal behavior among a sample of 100 juvenile offenders in a rural Midwestern county. Cluster analysis revealed subgroups of juveniles that were distinguished based on the crimes committed. Preliminary results show that these groups map onto the symptom clusters of conduct disorder as outlined by the DSM-5.

DOES COGNITIVE FLEXIBILITY TRAINING IMPROVE READING COMPREHENSION FOR ELEMENTARY STUDENTS?

Group Leader	Bove, Rebecca Undergraduate, Psychology
Group Members	DaShae Rodriguez-Harris, Undergraduate, Psychology; Kortne Shott, Undergraduate, Psychology; Emily Fry, Undergraduate, Art; Megan Stevens, Undergraduate, Psychology
Mentor	Prof. Alycia Hund
Authorship	Rebecca Bove; DaShae Rodriguez-Harris; Kortne Shott; Emily Fry; Megan Stevens

Successful reading requires the ability to think about multiple details (Cartwright, 2002). For instance, reading comprehension involves constructing meaning from text using a variety of information from the text, reader, and situation (Gnaedinger et al., 2016). One factor linked to improving reading comprehension is executive functioning, especially cognitive flexibility – the ability to switch fluidly between activities (Cantin et al., 2016). Previous studies have found that a training program focusing on reading-specific cognitive flexibility has led to gains in reading comprehension (Cartwright, 2002, 2006; Cartwright et al., 2016). The purpose of this study was to test the mechanisms by which cognitive flexibility improves reading comprehension during the elementary years by comparing four training procedures, which involve sorting object or word cards in multiple ways at the same time or on subsequent trials. We also included measures of oral reading fluency, vocabulary, executive functioning, and demographics as control variables. We recruited children in second to fifth grades to participate in our study, as well as their parent or legal guardian. To date, 53 children and parents/guardians have participated. Parents completed the demographic form and children completed six tasks throughout the study. Each child read a passage for three minutes and selected the correct word that made the most sense in that specific sentence. This data served as the baseline measure of reading comprehension prior to receiving the cognitive flexibility training. There were four versions of the training, and each participant was randomly assigned to one condition. Two conditions required simultaneous sorting to follow a pattern in a matrix whereas the other two conditions required sequential sorting into separate bins. The cards contained words or pictures of objects. Then, another reading comprehension task was given to assess change. Participants read a passage aloud to measure oral reading fluency and provided definitions of common words to measure vocabulary. The final task was the verbal fluency subtest from the *Delis-Kaplan Executive Function System (D-KEFS, 2001)*, where children provide lists of words with certain features. Preliminary results show that as expected, age, oral reading fluency, and executive functioning were related to reading comprehension. Sorting words sequentially led to large gains in reading comprehension, whereas the other three training procedures led to virtually no change in reading comprehension over time. These findings suggest training of reading-specific flexibility can improve reading comprehension during the elementary years.

QUALITY HEALTHCARE TRENDS OF CRITICAL ACCESS HOSPITALS IN THE STATE OF ILLINOIS

Group Leader	Call, Julia Undergraduate, Health Sciences
Group Members	Rebecca Miedema, Undergraduate, Health Sciences; Jennifer Bohner, Undergraduate, Health Sciences
Mentor	Prof. Jennifer Peterson
Authorship	Julia Call; Rebecca Miedema; Jennifer Bohner

The objective for this healthcare audit was to assess the overall quality of Critical Access Hospitals in the state of Illinois through the evaluation of a set of quality standards developed by a group of auditors. The auditors selected 20 critical access hospitals in the state of Illinois to serve as a sample study to collect quality data and information. Data elements collected and evaluated for the purpose of this audit include: RN staffing trends, EHR utilization, hospital affiliations, readmission rates, and accreditation status. Data obtained from these standards was used to assess the overall quality of each hospital in question, and provide a basis for recommendations to improve quality measures in Critical Access Hospitals.

REACHING ILLINOIS STATE UNIVERSITY'S HEATING DEMAND WITH BIOHEAT

Group Leader	Callahan, Timothy Undergraduate, Technology
Group Members	Morgan Vondruska, Undergraduate, Technology
Mentor	Prof. Jin Jo

This research study evaluates and analyzes the feasibility of incorporating biofuel into Illinois State University's current heating system. Using biofuel as a heat source has potential to create lower heat energy production costs and may cause a decrease in the university's carbon emission level. Illinois State University spends a large amount of money to meet heating demands of campus buildings. Does biofuel have the potential to meet the heating demand of Illinois State University or can it be incorporated into the current system in effort to lower Illinois State University's heating expenses and decrease green house gas emissions; what would need to be done to meet the campus-heating demand while utilizing some input of bioheat? As fossil fuels and prices of other energy sources fluctuate Illinois State University should consider cleaner alternatives as demand grows. This study aims to display a full grasp around the significant trade-offs between gas fired steam boilers, boilers that run off a petroleum based heating oil, and boilers that use blends of biodiesel. This research plays an important role in shift away from fossil fuels to cleaner and renewable sources of energy, like biofuels. This research study presents alternative opportunities of heat production that could potentially mean a lower cost of energy or decreases in cost of operations. A complete technical, economical, and environmental analysis presents the possible steps that are necessary to successfully produce bioheat at Illinois State University.

ASSESSMENT OF THE BLOOMINGTON-NORMAL UNSTOPPABLE CAMPAIGN

Group Leader	Chovancek, David Undergraduate, Health Sciences
Group Members	Patty Fountain, Undergraduate, Health Sciences; Braden Bankes, Undergraduate, Health Sciences; Jazmine Williams, Undergraduate, Health Sciences
Mentor	Prof. Jackie Lanier

The purpose of this needs assessment is to identify potential improvements to be made to the UNSTOPPALBE Campaign while utilizing social media outlets, youth surveys, and measuring the efficacy of current social marketing practices. With the increased prevalence of both alcohol and other illicit substances' use and abuse in today's youth within the Bloomington-Normal's high schools, community leaders have constructed a campaign to combat this preventable problem, primarily through educating the parents of said youth secondary to the measured interpretations students possess regarding substance abuse. As a continued means to improve this campaign's data-collection techniques, as well as aid in optimizing the educational needs and techniques geared towards the parents, interviews with various community leaders and officials were conducted to broaden the study's perspective while simultaneously gathering third-party suggestions for continued improvement methods. Additionally, updated surveys were administered to willing high school students in hopes of better measuring the current social norms within this demographic. The ultimate conclusions to be drawn from this study, while utilizing the gathered data from the high school's youth and assessing parents' educational needs to better approach this topic with their children, are that of creating the most objectively accurate assessment tools to yield data that was either previously under-addressed, as well as trending perceptions regarding substance abuse from parents and students alike.

DOES VISUOSPATIAL WORKING MEMORY AFFECT WAYFINDING USING TWO- AND THREE-DIMENSIONAL MAPS?

Group Leader

Cody, Olivia

Graduate, Psychology

Group Members

Natalie Costigan, Undergraduate, Psychology; Rachel Millard, Undergraduate, Psychology

Mentor

Prof. Alycia Hund

Authorship

Olivia Cody; Natalie Costigan; Rachel Millard

The ability to navigate successfully through one's environment via learning, recalling, and following a route is known as wayfinding. People need to memorize their route or utilize a GPS before beginning to navigate. Understanding how people represent their environment mentally during navigation, such as mental maps, is important so that maps can be presented in the most efficient way to facilitate navigation. Mental maps are flexible internal representations of an arrangement of environmental stimuli or the environment itself. Representation, understanding, and manipulation of information contained within mental maps of the environment rely heavily on visuospatial working memory--the ability to temporarily keep and manipulate visual information in one's mind, such as temporarily storing visual images and remembering sequences of locations in a scene. Wide individual differences in visuospatial working memory raises questions regarding how people with higher and lower visuospatial working memory represent their environment. The goal of our experiment was to understand how different types of maps and visuospatial working memory interact to influence wayfinding performance. At the beginning of the experiment, participants were asked to examine a two-dimensional map, three-dimensional map, or walk around the wayfinding environment. Then they were asked to find specific locations using the shortest possible routes within the DeGarmo basement. During wayfinding, participants were asked to perform two secondary tasks (visual and spatial) which tax the components of visuospatial working memory. In addition, there was a control condition where participants only find the designated room. We record wayfinding times, routes, and pauses for analysis. Overall, we predicted that participants would perform the worst when spatial working memory was taxed and the best for the control (no secondary task) in terms of their wayfinding ability with visual secondary task performance intermediate. We also predicted an interaction between visuospatial working memory secondary tasks and the map learning conditions, where wayfinding ability will decrease respectively with three-dimensional map, two-dimensional map, and the exploration conditions for the control (no secondary task) condition; whereas wayfinding ability will increase across the conditions respectively for the secondary task conditions. Data collection is ongoing, but preliminary analyses confirm our predictions. These findings are important in helping understand the role of maps and visuospatial working memory in successful wayfinding.

USING COMICS TO TEACH THE PSYCHOLOGY OF MORALITY

Group Leader	Daly, Paul Undergraduate, Psychology
Group Members	Cody Atkinson, Undergraduate, Psychology; Ryan Barta, Undergraduate, Psychology
Mentor	Prof. Eric Wesselmann
Co-Mentor(s)	Prof. J. Scott Jordan
Authorship	Paul Daly; Cody Atkinson; Ryan Barta; Feng Ji

Researchers from various disciplines (e.g., history, philosophy, cultural studies, rhetoric; Brozo, Moorman, & Meyer, 2014; Miller; 2015; Syma & Weiner, 2013) argue that comic books, like other types of texts (e.g., novels, film), can be used to teach course material. We suggest that comic books can teach readers about psychological research topics such as moral convictions, moral decision-making, and hero schemas (i.e., what makes someone a "hero," or defines certain acts as "heroic"). We highlight a specific text-Marvel Comics' Civil War-as an exemplar for teaching these concepts. We have conducted three studies thus far: two classroom-based studies and one laboratory study. We collected data from a seminar-based undergraduate capstone course (N=9), and a large lecture-based undergraduate social psychology course (N=234). In both classes, an instructor provided key examples from the text to illustrate course concepts. In the senior seminar course, the students read the text in conjunction with the lectures and wrote reflections (both informal notes and a formal paper) on the text. In both courses, students indicated their perception of the utility of using comic books to facilitate discussions about morality at the beginning of the semester and then after the lectures on Civil War. Finally, we presented the same basic measures in the laboratory study (N=95), as well as assessing various individual difference measures that may relate to participants' views on the moral issues discussed in the comic book material (e.g., moral foundations, tolerance for ambiguity). Both qualitative and quantitative data suggest that students in the classroom studies gained a new appreciation for comic books, how they can be interpreted within the context of psychological theories, and how they can be used to teach course concepts to individuals of various ages. We have completed the laboratory study but have yet to analyze these data. We will explore the bivariate correlations and interpret these data within the context of the classroom study findings. These data suggest that comic books can be a fruitful method of illustrating psychological concepts to college students, specifically research on conceptions of morality and moral decision-making. Future research can examine if certain individual differences may predict which students are more receptive than others to this teaching method. Future research can also examine how one's conceptions of morality may influence which characters they empathize with and how they ultimately define the concept of heroism.

PERFORMANCE VARIATION IN MEN'S WOVEN PANTS TREATED WITH WRINKLE RESISTANT FINISHES

Group Leader	DeWane, Abby Undergraduate, Family and Consumer Sciences
Group Members	Mackenzie Brown, Undergraduate, Family and Consumer Sciences
Mentor	Prof. Yoon Jin Ma
Authorship	Abby DeWane; Mackenzie Brown; Yoon Jin Ma

The purpose of this study was to identify the variation in performance capabilities of men's woven pants treated with wrinkle resistant finishes. Wrinkle resistant fabrics are created through a process called cross-linking in which the weak hydrogen bonds within the fiber are strengthened by a connecting agent such as dimethylol dihydroxyethylene urea (DMDHEU). This cross-linker creates covalent bonds with the cellulose to prevent creasing. Due to the change in the fiber's molecular structure, it was hypothesized, the addition of the cross-linking agent would cause variations in the performance capabilities of the fabric as per the American Society for Testing Materials (ASTM) and the American Association of Textile Chemists and Colorists (AATCC). To study this variation, the qualities of the fabric, the strength properties, abrasion resistance, refurbishing, and colorfastness properties of men's pants treated with wrinkle resistant agents and men's pants that were not treated with such finishes were evaluated and compared. These properties were evaluated through the following test methods: ASTM D 3775-98 Standard Test Method for Fabric Count of Woven Fabric, ASTM D 3776-96 Standard Test Method for Mass Per Unit Area (Weight), Macbeth Spectra light Test, ASTM D 5034-95 Breaking Strength and Elongation of Textile Fabrics, ASTM D 1421-96 Tearing Strength of Fabrics by Falling-Pendulum Test, ASTM D 3885-99 Abrasion Resistance of Textile Fabrics (Flexing and Abrasion Method), ASTM D 3886-99 Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Apparatus), AATCC 135-2004 Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics, AATCC 88B-2003 Smoothness of Seams in Fabrics after Repeated Home Laundering, AATCC 61-2006 Colorfastness to Laundering, Home and Commercial, AATCC 8-2005 Colorfastness to Crocking, and AATCC 15-2002 Colorfastness to Perspiration. In accordance to the results, it has been concluded wrinkle resistant finishes negatively impact the strength properties and abrasion resistance of fabrics, while positively impacting the refurbishing and colorfastness capabilities. From these conclusions, a recommendation for consumers can be made. It is recommended woven pants with wrinkle resistant finishes should be bought exclusively for when the fabric is not expected to experience significant amounts of abrasion. Additionally, if the consumer desires a garment that will persist in color, dimension, and seam appearance through repeated laundering, purchasing of fabric without wrinkle resistant finishes is suggested. From this study, future research can be conducted on how fabrics with wrinkle resistant finishes can be enhanced.

REPRESENTATION OF AGING WOMEN IN FASHION AND NON-FASHION ADVERTISEMENTS

Group Leader	DeWane, Abby Undergraduate, Family and Consumer Sciences
Group Members	Katie Cavanaugh, Undergraduate, Family and Consumer Sciences; Marissa Weuthrich, Undergraduate, Family and Consumer Sciences; Mackenzie Brown, Undergraduate, Family and Consumer Sciences; Katie Cavanaugh, Undergraduate, Family and Consumer Sciences; Clair VanDerginst, Undergraduate, Family and Consumer Sciences; Emma Walton, Undergraduate, Family and Consumer Sciences
Mentor	Prof. Ui-Jeen Yu
Authorship	Abby DeWane; Marissa Weuthrich; Mackenzie Brown; Katie Cavanaugh; Clair VanDerGinst; Emma Walton; Ui-Jeen Yu

Women over forty are seldom included in fashion advertisements. Fashion media focus mainly on the representation of youth and young women. The ageist practices of fashion media potentially harm the body image of older women and classify the aging body as undesirable. Media's portrayal of older women negatively influences society's views on aging women, and builds a distorted view of older women and their aging process. Previous studies overlooked the differences in the inclusion of older women in both fashion and non-fashion magazines. Thus, the purpose of this study was to investigate how older women are represented in fashion media compared to non-fashion media, based on the social comparison theory (Festinger, 1954). A content analysis is conducted by collecting and analyzing a total of 200 advertisements from fashion and non-fashion magazines. Results indicate the majority of women featured in high popularity fashion and non-fashion magazines are young with few to no wrinkles, usually in their twenties. Non-fashion advertisements feature more women in their thirties and older than the fashion advertisements, but are often portrayed younger than they truly are. Both fashion and non-fashion advertisements prefer using younger women instead of aging women to market their products, even if the product is marketed to the aging demographics. Overall, aging women are highly underrepresented in both fashion and non-fashion advertisements in the American, youth-oriented culture.

ON THE LAMBDA-FOLD SPECTRUM PROBLEM FOR THE CUBIC MULTIGRAPHS OF ORDER 8

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Group Members	Katilyn Battista, Undergraduate, Mathematics; Colleen Hehr, Undergraduate, Mathematics; Tracer Mills, Undergraduate, Mathematics
Mentor	Prof. Saad El-Zanati
Co-Mentor(s)	Prof. Ryan Bunge

Graphs are mathematical means of exhibiting relationships between objects. The objects are denoted by points, called *nodes*, and each pair of related objects is joined by a line, called an *edge*. For example, friendships on social media can be represented by “friendship graphs”. People are denoted by nodes and two nodes are joined by an edge if the corresponding people are friends of Facebook. In a *multigraph*, multiple edges are allowed between pairs of nodes. The class of complete graphs is of particular interest. The λ -fold complete graph of order n , denoted by λK_n , is the graph on n nodes with the property that every pair of nodes is joined by λ edges. A graph G is *cubic* if every node in G has 3 edges joined to it. A common problem in the study of graphs is the problem of deciding when a large graph or multigraph can be partitioned (i.e., divided up) into pieces that all have the exact same structure as some smaller (multi)graph G . The *spectrum problem* for a given multigraph G is the problem of determining the values of n so that λK_n can be partitioned into copies of G . This problem has been studied and settled for cubic multigraphs on less than 8 nodes. We study it for the cubic multigraphs on 8 nodes.

YOUNG CHILDREN'S UNDERSTANDING OF ORDINAL, SPATIAL, AND ALPHABET LABELS IN A SPATIAL SEARCH TASK

Group Leader	Fairweather, Lauren Undergraduate, Psychology
Group Members	Cody Heap, Graduate, Psychology; Morgan Maydew, Undergraduate, Psychology; Analeese Monla, Undergraduate, Psychology; Kristina Okamura, Undergraduate, Psychology; Meghan Rogers, Graduate, Psychology
Mentor	Prof. Alycia Hund
Authorship	Cody Heap; Meghan Rogers; Lauren Fairweather; Analeese Monla; Morgan Maydew; Kristina Okamura

Preschool children demonstrate rapid gains in conceptual understanding and language comprehension. Understanding temporal and spatial ordering is important in everyday life, such as when completing instructions in order, understanding narrative sequences, and keeping track of locations in space. Recent research findings highlighted 4- and 5-year-old children's emerging ability to understand ordinal labels (e.g., first, second, third) to help them search for stickers hidden in toy train cars (Miller, Marcovitch, Boseovski, & Lewkowicz, 2015). The goal of this project is to replicate this work and to extend it in two important ways: (1) to extend the age range downward to 3 years to more fully understand the developmental trajectory, and (2) to compare the ordinal labels used by Miller et al. (2015) (first, second, third) to spatial labels (front, middle, back) and to a control condition also using a familiar sequence (A, B, C). To date, 112 3-, 4-, and 5-year-old children were familiarized with a toy train that included an engine, three identical cars, and a caboose and with the labels used in their experimental condition. Then, the children completed six test trials where they heard the labels for the cars (depending on their condition) and tried to find a sticker hidden in the indicated car after it had been hidden from view. The proportion of correct searches was then calculated. Parents/Guardians were asked to complete a brief demographic survey and a language checklist to provide additional details about child language development. We expect that search performance will differ across conditions and will increase with age, especially for the most difficult spatial condition. We also expect that search performance will be related to parent reports of child language. These findings will provide important details about young children's understanding of ordinal and spatial language.

FEASIBILITY STUDY ON IMPLEMENTING GREEN TECHNOLOGY AT THE ILLINOIS STATE UNIVERSITY RECREATIONAL CENTER

Group Leader	Felske, Shane Undergraduate, Technology
Group Members	Riley Vines, Undergraduate, Technology; Andy Agamy, Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Shane Felske; Riley Vines; Andy Agamy

Our study focuses on the feasibility of implementing green technology at the Illinois State University Rec. Center. This implementation will harness power from human generated energy, capture sunlight through photovoltaic (PV) arrays, and reduce energy costs. The purpose of this project is to report the economic and technical feasibility based on cost benefit analyses and potential energy savings. The ISU Rec. Center has a high demand of electricity, so the idea of green energy should be relevant.

PARENT INVOLVEMENT AND THE PARENT-TEACHER RELATIONSHIP IN HEAD START ON CHILD OUTCOMES

Group Leader	Gallo, Ciara Undergraduate, Psychology
Group Members	Cristina Prestin-Latham, Graduate, Psychology; Leah Delew, Graduate, Psychology; Rachel Flores, Undergraduate
Mentor	Prof. Adena Meyers
Authorship	Cristina Prestin-Latham; Leah Delew; Rachel Flores

Previous literature emphasizes the importance of parent involvement in Head Start on positive child outcomes. This project is a review of literature on the predictors and barriers to parent involvement and how a strong parent-teacher relationship has an impact on involvement. Parents who are involved in their child's Head Start program and collaborate with their child's teacher are more likely to use less harsh discipline, reduce conduct problems in their child, and engage in academic activities at home (Webster-Stratton, Reid, & Hammond, 2001). Positive child outcomes as a result are improved academic and behavior skills (Ansari & Gershoff, 2016). Implications of the research are implementing proposed intervention programs to educate parents on how to become more involved at the center and how to improve their parenting practices (Mendez, 2010).

DIFFERENTIAL EFFECTS OF REINFORCEMENT IN SHELTER VERSUS PET DOGS

Group Leader	Gavin, Jennifer Graduate, Psychology
Group Members	Antonia Berenbaum, Undergraduate, Psychology
Mentor	Prof. Valeri Farmer-Dougan
Authorship	Jennifer Gavin; Antonia Berenbaum

When giving a reinforcer it is important to understand the effects of the "delivery system" for that reinforcer. For example, dogs with little experience with human interaction may react differently to a human delivered reinforcer than dogs more experienced with human interaction. This effect can be predicted by the Disequilibrium Model (Timberlake & Farmer-Dougan, 1991), which states that the degree to which the ratio of instrumental (I) to contingent (C) responding is disrupted from a baseline bliss point (O_i/O_c) results in predictable reinforcement effects. The present study used this model to measure baseline approaches to humans versus a mechanical feeder for two groups of dogs. Using baseline approach rates, the model accurately predicted differences in reinforcer efficacy of human-delivered reinforcers between dogs who were experienced with versus those with little experience interacting with humans. The data support the predictions of the disequilibrium model and demonstrate the importance of assessing baseline rates of both the contingent and operant response to determine reinforcer efficacy.

EFFECTIVENESS OF A JACKPOT TO DECREASE SESSION TIME FOR DISCRETE TRIALS IN CANINES

Group Leader	Gavin, Jennifer Graduate, Psychology
Group Members	Antonia Berenbaum, Undergraduate, Psychology
Mentor	Prof. Valeri Farmer-Dougan
Authorship	Antonia Berenbaum; Jennifer Gavin

Jackpots (a 1-time increase in reinforcer magnitude within a session) are widely used in dog training, yet little empirical data exist to support their use. For example, Muir (2010) found no increase in response rate when a jackpot was used within a single-operant setting, but dogs did increase responding to the jackpot alternative during concurrent schedules. Research in behavioral economics, particularly temporal discounting, has investigated jackpots in humans. This research suggests that jackpots given at different times within the session have differing reinforcer value, suggesting a discounting of the jackpot value across session time. To examine the potential effect of jackpot discounting and frequency, the present study examined the time for dogs to complete a 20-trial simple contingency when the jackpot was presented at the end or middle of the session. Study two examined the rate to completion when the rate of jackpots varied from 5% to 100% of trials. Consumption time was subtracted from total session time to prevent a confound of consumption time with increased jackpots. Results showed no significant increase in completion speed for a single jackpot given at the end versus middle of the trials; increasing the rate of jackpots significantly slowed the dogs' response time.

SEPARATION ANXIETY, ATTACHMENT, AND SENSORY STATUS: ARE DEAF DOGS MORE ATTACHED TO THEIR HUMAN?

Group Leader	Gavin, Jennifer Graduate, Psychology
Group Members	Antonia Berenbaum, Undergraduate, Psychology; Ashley Vazquez, Undergraduate, Psychology; Heather Curcio, Undergraduate, Psychology; Keegan Samolinski, Undergraduate, Psychology; Sydney Penna, Undergraduate, Psychology
Mentor	Prof. Valeri Farmer-Dougan
Authorship	Ashley Vazquez; Jennifer Gavin; Heather Curcio; Antonia Berenbaum; Keegan Samolinski; Sydney Penna

Traditionally, the American Kennel Club (AKC) and breed specific clubs (Dalmation Club of America; Australian Shepherd Club of America) advocated the immediate euthanasia of HVI dogs. Folklore held that these dogs were untrainable, aggressive and made poor family pets (Strain, 2011). Research in our lab (Farmer-Dougan, et al., 2014; Farmer-Dougan, 2017) has shown that these dogs can, indeed, be trained. As a result, the AKC and breed clubs have started to change their policies. However, little is known about the appropriate way to train these dogs, or how and why behavior problems may develop that are specific to this population. Our research suggest that these dogs may be more prone to higher attachment and separation anxiety. The present project will examine the form of attachment and behaviors related to the three main attachment types. Understanding differences in attachment between HVI and NHV dogs, if they exist, will allow trainers and behaviorists to develop improved training and intervention methods.

PREVENTING PRESSURE ULCERS AND SKIN TEARS: AN EVIDENCE-BASED PRACTICE PROJECT

Group Leader	Gingrich, Meghan Undergraduate, Nursing
Group Members	Rebecca Offenback, Undergraduate, Nursing; Taylor Pohlman, Undergraduate, Nursing
Mentor	Prof. Michele Shropshire
Authorship	Meghan Gingrich; Taylor Pohlman; Rebecca Offenback

Background: Both pressure ulcers and skin tears pose complications for elderly patients in long-term care settings. Pressure ulcers are localized areas of damage to the skin and underlying tissues and can be brought on by pressure, friction, malnutrition, and immobility. Complications include infection, sepsis, bacteremia, and cellulitis. A skin tear is a wound that results from friction or shear forces that separated skin layers caused by impaired mobility, poor nutrition, sensory impairment, or generalized friction forces. Complications include infection and poor skin integrity. Research in prevention of pressure ulcers and skin tears in the elderly population is important to ensure minimalization of life-threatening complications.

Aim: Our aim of this evidenced-based practice project was to enhance knowledge regarding preventing pressure ulcers and skin tears in the older adult in long-term care.

Results: Evidence-based preventative measures for pressure ulcers included new-and-improved support surfaces such as lateral tilt, hybrid, and alternating mattresses; vitamin and protein supplements; and alternative dressings such as silicon foam. For skin tears, specific skin creams such as pH neutral cleaners and avoidance of emollients; non-adherent and paper tape usage; and silicone contact bandages decreased occurrences of skin tears among the elderly population.

Conclusion: In the elderly population, prevention of skin tears and pressure ulcers can be as simple as utilizing newly researched materials or changing basic procedures to account for technological advances. These non-pharmacological interventions to prevent pressure ulcers and skin tears increase longevity and quality of life for elderly persons in long-term care settings.

REFERRED STUDENTS' MOTIVATORS AND BARRIERS TO PARTICIPATE IN AN EIMOC PROGRAM

Group Leader	Hevel, Derek Graduate, Kinesiology & Recreation
Group Members	Lauren Von Schaumburg, Graduate, Kinesiology & Recreation
Mentor	Prof. Kristen Lagally
Authorship	Kristen Lagally; Derek Hevel; Lauren Von Schaumburg; Anna Rinaldi-Miles

PURPOSE: The purpose of this study is to describe the students' motives and barriers to participating in an Exercise is Medicine on Campus (EIMOC) program at Illinois State University.

METHODS: Referrals are initiated by Student Health or Counseling Services, and referred students complete an intake session with the School of Kinesiology and Recreation (KNR) Exercise is Medicine on Campus staff. Students are referred to the School of KNR EIMOC program, which is informed and implemented by graduate students and Exercise Science faculty with expertise in the areas of exercise physiology, biomechanics, and exercise psychology. Specific diagnoses are not currently provided by Student health or counseling services to EIMOC staff.

RESULTS: Since the initiation of the referral system in 2016, 40 students (Women = 30, Men = 10) have been referred to the EIMOC program - 30 from Health Services and 10 from Counseling Services. Approximately half of these were already performing some activity, but were either not meeting recommended levels of PA or needed assistance with their exercise program. At the time of submission, ten of the 40 had completed full intake questionnaires and consent forms. Descriptive statistics were calculated to identify reasons for pursuing participation in the EIMOC program and clients' current motivations for and barriers to physical activity. All subjects cited "improving energy levels" as an important motivator for physical activity. The top three reported barriers for physical activity were Lack of Willpower (M+SD = 6.1+2.9), Lack of Energy (M+SD = 4.4+2.4) and Social Influence (M+SD = 4.0+1.8). Privacy of the exercise sessions (90%), expertise of the staff (90%), and physician referral (70%) were selected as strong motivators for pursuing the EIMOC program. **CONCLUSION:** These preliminary data suggest that students referred to Illinois State University's EIMOC program pursue it due to an interest in increasing physical activity levels in a private, supervised setting.

ATTITUDES AND PERCEPTIONS OF EMERGENCY DEPARTMENT NURSES TOWARDS ATTEMPTED SUICIDE: A SYSTEMATIC REVIEW

Group Leader	Kastelic, Anna Undergraduate, Nursing
Group Members	Mikayla Cooksey, Undergraduate, Nursing
Mentor	Prof. Kim Astroth
Co-Mentor(s)	Prof. Wendy Woith
Authorship	Mikayla Cooksey; Anna Kastelic; Kim Astroth; Wendy Woith

Background: The leading predictor for completed suicides is a previous attempt. After attempted suicide, quality care in the emergency department (ED) may decrease repeat attempts. The attitudes of ED nurses, often the first individuals to interact with these patients, may have a significant impact on their health, future treatment, and overall perception of the healthcare system. Due to negative experiences with ED nurses, an individual's hesitancy to seek support could potentially lead to a successful suicide. **Objectives:** The aim of this systematic literature review is to report a comprehensive analysis of the attitudes that ED nurses have toward patients who have attempted suicide.

Method: A literature search was conducted utilizing PubMed and the following EBSCO databases: Cumulative Index to Nursing and Allied Health Literature, Academic Search Complete, and Psych Info. After duplicates were removed, articles equaled 409. Additional exclusion criteria were applied, resulting in 37 articles. Upon analysis, six relevant articles were kept for further study. The original searches were rerun, resulting in twelve additional articles, two of which were included. **Results:** The final eight articles consisted of two qualitative and six quantitative studies. Four studies found ED nurses reporting more positive attitudes, two studies reported more negative attitudes, one study was inconclusive, and one study focused on lack of humanized care.

Discussion/Conclusion: Findings suggest that increased age, mental health experience, and education correlate with more positive attitudes toward patients who have attempted suicide. More research is necessary to further evaluate nurse attitudes.

ONLINE BRAND PRODUCT INTRODUCTION STRATEGY

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Mentor	Prof. Steven Taylor

Project Objective: Review existing knowledge including existing competitors, how consumers choose between alternatives in the consumer decision-making process. We seek to gain better insights into the competitive content.

Collection of new data: Identify an appropriate basis for a positioning strategy. We will try to ascertain generally how much to focus on gain versus emotion through a survey of 150 undergraduate students at Illinois State University.

Results: Identify a pool of potential new brand names and based on two preceding steps, make a recommendation.

Implications: Identify some practical considerations as the basis for an online brand product introduction strategy.

ADVANCING THE ILLINOIS RENEWABLE PORTFOLIO STANDARD GOALS WITH WIND TURBINE REPLACEMENT IN ILLINOIS

Group Leader	Krull, Bennet Undergraduate, Technology
Group Members	Charlie Reice, Undergraduate, Technology; Michael Simpson, Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Michael Simpson; Bennet Krull; Charlie Reice

According to the Renewable Portfolio Standard (RPS), the state of Illinois should be on track to reach 25% of energy production coming from renewables. Within this 25% production, 75% must come from wind due to wind's dominate nature in the Midwest. This study analyzes what the current wind production in Illinois is and how it can be further improved. Illinois currently produces its own wind energy but does not reach the amount of wind that should be produced according to the RPS.

To make up for these shortcomings, the state purchases renewable energy credits from outside sources to be included in the RPS. As technology continues to improve, Illinois is better equipped to meet the RPS each fiscal year. Utilizing data from the U.S. Energy Information Administration, we were able to extract numbers for wind production in each year leading up to 2016. At the time of this study, no information had been released on production in 2017. We also gathered information from specific wind farms to determine what types of wind turbines produced the most energy and the age of these wind farms. Applying data collected, we ran tests using the simulation software Windographer to determine how much more energy will be produced in Illinois if all of the wind turbines older than 15 years are repowered.

AVAILABILITY OF QUALITY ENGINEERING RESOURCES AND LESSONS FOR A HIGH SCHOOL CHEMISTRY CLASSROOM

Group Leader	Lieberum, Kyle Undergraduate, Chemistry
Group Members	Bayleigh Mull, Undergraduate, Chemistry
Mentor	Prof. Sarah B. Boesdorfer
Co-Mentor(s)	Prof. Anna Marie Arias
Authorship	Kyle Lieberum; Bayleigh Mull

According to the new [Next Generation Science Standards \(NGSS\)](#), engineering should be part of the learning process in science classes. However, most current science teachers were not trained on how to teach engineering in their classes. Our investigation focused on the curricular resources available to high school chemistry teachers to incorporate engineering into their curriculum. Specifically, we gathered 20 activities involving stoichiometry and engineering from a variety of sources which include TeachEngineering.org and searches through web browsers. Then we coded the materials to assess what supports these activities provided for chemistry teachers. According to our initial findings, thorough resources easily accessed by teachers are difficult to find. The resources that are available are typically lacking background knowledge or helpful tips for teachers to understand the content they are teaching. It is essential for teachers to understand the content and pedagogical concepts they are trying to teach, including rationales for the activities if they are going to incorporate them. In addition, the engineering content knowledge provided in these materials for chemistry teachers is discussed. Implications for resources available to support chemistry teachers in fully implementing NGSS in their classes are discussed.

INTERACTIONS BETWEEN THE COG COMPLEX AND APT7A IN NEURODEGENERATIVE DISEASE

Group Leader	McArthy, Jacob Undergraduate, Biological Sciences
Group Members	Lindsey Margewich, Undergraduate, Biological Sciences; Tavaris Coleman, Undergraduate, Biological Sciences,
Mentor	Prof. Alysia Mortimer
Authorship	Savanah Taylor

Menkes disease is an X-linked neurodegenerative disease caused by a defect in copper transport. Such defects can come from mutations in the ATP7A copper transporter gene. ATP7A mutations result in abnormal distribution of copper, leading to reduced copper in the brain and other tissues. One of the protein complexes found to interact with the ATP7A gene is the Conserved Oligomeric Golgi (COG) complex. For this study, we are modeling the interactions between the COG complex and ATP7A in the *Drosophila* nervous system. Since ATP7 is a copper transporter, we wanted to test how manipulating COG1, COG5, and COG8 affects ATP7's ability to respond to copper. We have performed experiments with the COG1 mutants crossed with ATP7 over-expression flies to determine how loss of COG1 influences the viability of ATP7 over-expression flies. We found that the overexpression of ATP7 resulted in reduced viability. COG1 mutants that also overexpressed ATP7 showed no viability, whereas COG1 mutants showed a reduced phenotype. We also found that inhibiting other members of the COG complex show a reduced viability phenotype. Similar results were found during our copper experiments testing COG5 and COG8. We have found that loss of either COG5 or COG8 cause increased sensitivity to copper as compared to the controls. Also, the combination of both ATP7 over-expression and COG5 inhibition and ATP7 over-expression and COG8 inhibition both showed a significant increase sensitivity copper compared to the control. The combination also showed a slight reduction in copper sensitivity as compared to both inhibition of COG5 or COG8. We are currently are testing the interactions of other members within the COG complex.

THIS MITE BE A LITTLE BIT EASIER: DEVELOPMENT OF A USER-FRIENDLY QUANTIFICATION METHOD OF ECTOPARASITE INFESTATION IN BIRD NESTS

Group Leader	McDonald, Jocelyn Graduate, Biological Sciences
Group Members	Danny Hanrahan, Undergraduate, Biological Sciences; Elliot Lusk, Undergraduate, Biological Sciences; Colleen Quinn, Undergraduate, Kinesiology and Recreation; Danny Hanrahan, Undergraduate, Biological Sciences
Mentor	Prof. Joseph Casto

While several methods can be used to assess ectoparasite abundance in bird nests, many are labor and time intensive, and some destroy nests and kill all the ectoparasites they contain, which limits their use in future ectoparasite inoculation studies. In this project, we developed and tested a less disruptive method, designed to specifically assess the abundance of northern fowl mites (*Ornithonyssus sylviarum*) in European starling (*Sturnus vulgaris*) nests after nest leaving by young. The method relies on mites' increased activity in response to vibration and positive thermotaxis, two behaviors that allow them to readily locate hosts. In order to establish standardized mite infestations, after the last egg was laid in each nest, we added approximately 75 northern fowl mites (NFM). Immediately following mite addition, we generated variation in infestation intensity by spray-application of one of three experimental treatments to each nest: a distilled water control, the pesticide permethrin, or the pesticide methoprene. We repeated nest treatments approximately every ten days. Immediately prior to hatching, we inspected eggs in all nests for blood spots caused by blood-feeding ectoparasites biting the skin of incubating adults and ranked them on a four-point spottiness scale. We first assessed NFM load following nest leaving by knocking on the side of a nest box to induce mites to begin moving. Ten seconds later, a warmed reusable plastic ice cube was placed in the center of the nest. After one minute, the ice cube was removed and plunged into a jar of ethanol to kill and preserve the mites that had climbed onto it. Next, we collected the entire nest and placed it in a Berlese funnel. For four days, we used a heat lamp to drive ectoparasites and other arthropods through the nest material into a collecting jar containing ethanol. We filtered the samples from both collection methods and identified and counted arthropods using a dissecting microscope. Initial findings suggest that the "plastic ice cube" method collected only NFM with little nest debris, while the funnel method collected several species of arthropods (including NFM), but with abundant nest debris. We will compare results of these two methods to each other as well as to the earlier-collected egg spottiness data to assess whether the new method provides results that are consistent with the more traditional funnel method.

KEEPING THE BLOOD-SUCKING PARASITES AT BAY: EFFECTS OF PESTICIDES WITH DIFFERENT MODES OF ACTION ON NEST INFESTATION AND NESTLING

Group Leader	McDonald, Jocelyn Graduate, Biological Sciences
Group Members	Elliot Lusk, Undergraduate, Biological Sciences; Colleen Quinn, Undergraduate, Kinesiology & Recreation; Danny Hanrahan, Undergraduate, Biological Sciences
Mentor	Prof. Joseph Casto

Blood-feeding ectoparasite infestations in bird nests can induce resource tradeoffs in nestlings among somatic growth, physiological maturation and immune function, and serve as a valuable experimental model of developmental stress. Many experimental methods have been reported to reduce ectoparasite abundance in bird nests, but given the diversity of bird nest types, not all methods are equally effective in nests of a given species. The pesticide Permethrin reduces ectoparasitic mite load in European starling (*Sturnus vulgaris*) nests, but increases plasma corticosterone concentrations in starling nestlings. Moreover, Permethrin treatment of nests can reduce somatic growth in nestling songbirds. These unintended side effects of pesticide application can impede a clear experimental assessment of the effects of ectoparasites on nestling development. Here we present an experimental study that compares the effects of two different pesticides, Permethrin and Methoprene, on various indices of starling nestling development and ectoparasitic infestation, in order to identify a potentially superior experimental treatment for eradication of ectoparasites in starling nests. Permethrin and Methoprene combat ectoparasites through different modes of action. Permethrin acts as a neurotoxin, and methoprene is a juvenile hormone mimic that inhibits maturation and reproduction of arthropods. Because Methoprene acts by targeting hormone receptors specific to arthropods, it is unlikely to directly influence songbird development. To establish standardized mite infestations, we added approximately 75 northern fowl mites (*Ornithonyssus sylviarum*) to each starling nest when egg laying ceased. Immediately following the addition of mites, we spray-treated nests with one of three treatments: a distilled water control, Permethrin or Methoprene. We repeated nest treatments approximately every ten days. To calculate effects on somatic growth, wing length, tarsus length and body mass of each nestling was measured on brood days 5, 10 and 15. On brood days 10 and 15, five microliters of blood was collected via brachial veinipuncture to calculate hemoglobin concentration, and another 250 microliters of blood was collected to assess hematocrit, blood glucose and plasma corticosterone. Preliminary results suggest that nestling growth was unaffected by nest treatments, despite hemoglobin concentrations of nestlings in permethrin treated nests being higher than in the other two treatments, especially on day 15. The remaining results will be discussed further after ongoing analyses are completed.

REDUCING THE SOFT COSTS OF SOLAR ENERGY: A COST COMPARATIVE ANALYSIS BETWEEN CONVENTIONAL AND PLUG-AND-PLAY SOLAR PV SYSTEMS

Group Leader	O'Hara, Brandon Undergraduate, Technology
Group Members	Tyler Miller, Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Tyler Miller; Brandon O'Hara; Jin Jo

The solar industry today is steadily growing, but the non-hardware cost or soft costs that arise in the U.S. account for 64% of a new PV system, which keeps overall cost high. High cost does the opposite of creating incentive for consumers to invest in such a product. However, new Plug-and-Play PV systems are being developed that provide simple Do-it-Yourself (DIY) instructions so that consumers can purchase and install their own solar systems and plug them into a standard 120V or 240V outlet. These new systems are expected to decrease overall system cost by 40%. At the same time, DIY installations will create less installations for installers and therefore drive down their installation price in a competitive market. By conducting a case study we hope to find the savings associated with the installation of a number of relatively small Plug-and-Play PV systems. We can then further demonstrate these savings by comparing it to the costs that a normal grid-tied PV system would incur. Through our comparative analysis we can determine the feasibility of using Plug-and-Play PV systems over conventional PV systems.

KARST SUSCEPTIBILITY TO ANTHROPOGENIC INFLUENCES IN THE DRIFTLESS AREA OF NORTHWEST ILLINOIS

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Group Members	Joseph Honings, Graduate, Geography, Geology and the Environment; Andrew Oberhelman, Graduate, Geography, Geology and the Environment; Andrew Watson, Graduate, Geography, Geology and the Environment; Ian Rusthoven, Graduate, Geography, Geology and the Environment
Mentor	Prof. Eric Peterson
Authorship	Prince Oware; Joe Honings; Andrew Oberhelman; Ian Rusthoven; Andrew Watson; Eric W. Peterson; Ben Maas

In karst, the water chemistry of spring waters reveals the interactions between surface water and groundwater. Concerns about anthropogenic influences on the waters in northwest Illinois prompted an investigation examining the water chemistry of local springs and streams. For a year, six streams and six springs were sampled monthly for concentrations of major ions, pH, temperature, specific conductance, dissolved oxygen, biological oxygen demand, turbidity, and total coliform. Qualitative and quantitative analyses, including principal component analysis (PCA), were conducted to assess the influences of surface conditions on the karst waters. When plotted on a Piper Diagram, both waters displayed similar hydrochemical facies: Ca-Mg HCO₃. PCA confirmed the importance of water-rock interaction on the water chemistry, but highlighted differences among the parameters controlling the anthropogenic chemical signatures of the waters. These anthropogenic impacts observed in both waters include NO₃-N and total coliform. NO₃-N concentrations ranged from 2.9 to 14.6 mg/L for the streams and from 0.3 to 30.1 mg/L for the springs; reported background concentrations are 2.5 mg/L. Total coliform was detected in both waters, with more frequent and higher counts in the stream water. The pH (6.5±0.15:mean±standard deviation) and the calcite saturation index values (-0.60±0.21) of the spring waters imply short residence times within the karst system, limiting any remedial mechanism in the subsurface. Overall, the chemical fingerprints of the stream and spring waters display differences; however, both streams and springs are susceptible to anthropogenic practices.

CORRELATION OF CROP COVER AND NITRATE IN TWO AGRICULTURAL WATERSHEDS, A PRELIMINARY INVESTIGATION

Group Leader

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Group Members

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Mentor

Prof. Eric Peterson

Authorship

Jacob Piske; Claire Harris; Monique Rutte; Nicolette Sheffield; Eric Peterson; Jonathan Thayn

Increased availability and reduced cost of synthetic-nitrogen fertilizers have resulted in the excess deposition of nitrogen in surface water reservoirs. The accumulation of nitrogen has created deleterious effects, generating algal blooms and hypoxic zones. Differences in the utilization rate of nitrogen and the rate of nitrogen application for corn and soybean suggest that nitrogen concentrations, for this work nitrate, may be correlated to the percentage of land cultivated for corn or soybeans in a watershed. To investigate potential relationships, stream-water nitrate concentrations (NO₃-N) and the percentage of land-use devoted to corn and to soybeans in two agricultural watersheds, a small 6.5 km² (LK1) and a large 35.6 km² (LK7), were analyzed. Five years of data for both nitrate and land-use were available for evaluation: 2006, 2007, 2008, 2015, and 2016. During those years, corn accounted for 23-31% in LK7 and 11-21% of the land-use in LK1. Land-use devoted to soybeans ranged between 19-27% (LK7) and 9-21% (LK1). The ratio of land cultivated for corn as compared to soybeans ranged from 0.87-1.65 and 0.51 to 2.27. For LK1, a positive correlation between stream-water NO₃-N and the land devoted to soybeans, and a negative correlation between NO₃-N and land for corn production were observed. For the larger watershed, opposite and weaker correlations were observed. The results indicated there may be a watershed size threshold or alternative factors, i.e. presence of tiles in the watershed, that have a greater influence on nitrate concentrations.

INDIVIDUAL AND FAMILY IMPACTS OF THE EARLY HEAD START HOME VISITING PROGRAM

Group Leader	Prestin-Latham, Cristina Graduate, Psychology
Group Members	Leah DeLew, Graduate, Psychology; Rachel Flores, Undergraduate, Psychology; Ciara Gallo, Undergraduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Cristina Prestin-Latham; Leah DeLew; Rachel Flores; Ciara Gallo; Adena Meyers

This poster presents a review of literature examining the short-term and long-term effects of Early Head Start Home Visiting Program (EHS-HV) on children's developmental outcomes. The program has been associated with a host of benefits including reducing social problems in children (Jones Harden, Chazan-Cohen, Raikes & Vogel, 2012), increasing school readiness (Roggman, Cook, Innocenti, Jump Norman, Boyce & Christiansen, 2016; Sama-Miller, Akers, Mraz-Esposito, Zukiewicz, Avellar, Paulsell & Del Grosso, 2017), reducing parental stress and creating more positive parent-child relationships (Jones Harden et al., 2012), decreasing the use of physical punishment such as spanking (Howard & Brooks-Gunn, 2009), and the prevention of child abuse and neglect (Howard & Brooks-Gunn, 2009). Research also indicates that a variety of key individual-level and contextual factors moderate the effectiveness of home visiting. For example, factors such as unstable housing (Staerkel & Spieker, 2006), parental mental health (Becker, Patterson, Fagan & Whitaker, 2016), and the relationship between the home visitor and the parent (Korfmacher, Green, Staerkel, Peterson, Cook, Roggman, Faldowski & Schiffman, 2008) can influence the effectiveness of home visiting, even leading to unfavorable outcomes in some instances. Additionally, attrition rates and staff turnover rates in home visiting programs are high, which can influence the program's success and cost effectiveness (Howard & Brooks-Gunn, 2009; Sama-Miller, Akers, Mraz-Esposito, Zukiewicz, Avellar, Paulsell & Del Grosso, 2017). Findings indicate that although intervention programs such as EHS-HV are costly to run, they can have high payoff for the communities where they take place in the long-term. (Howard & Brooks-Gunn, 2009).

IMPAIRED AVOIDANCE IN C. ELEGANS MODEL OF DUCHENNE MUSCULAR DYSTROPHY

Group Leader

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Graduate, Biological Sciences

Group Members

Kevin Tragesser, Undergraduate, Biological Sciences; Joe Schweickert, Undergraduate, Biological Sciences

Mentor

Prof. Andrés Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a lethal degenerative disease that affects 1 in 3,500 males. DMD is caused by mutations in the dystrophin gene, which is expressed in muscle and nervous tissue. About one-third of DMD patients show developmental delays, among other neurological phenotypes, and muscle-wasting that eventually leads to death. *C. elegans* is unique among animals used in DMD research in its ability to model not only the genetic insult, but also the behavioral and cellular phenotypes observed in patients. To determine if *Caenorhabditis elegans* can also be used to model the neurological deficits of DMD, we ran dystrophic (*dys-1*) worms through a series of learning and sensory tests. Using RNA interference, we reduced expression of dystrophin in nervous tissue. We saw worms detected and oriented normally towards low appetitive concentrations of a chemical cue. However, when dystrophin was suppressed in nervous tissue, worms did not orient away from high, noxious concentrations of a chemical cue. This suggests that impaired avoidance was due to lack of *dys-1* in neurons, and not due to motor impairments. The current experiments suggest that *C. elegans* may also be used to model the neurological impairments making *C. elegans* an all-inclusive animal model for DMD.

30-DAY HEART FAILURE READMISSION RATES OF ILLINOIS HOSPITALS

Group Leader	Schrementi, Angela Undergraduate, Health Sciences
Group Members	Stephanie Zimmerman, Undergraduate, Health Sciences
Mentor	Prof. Jennifer Peterson
Authorship	Angela Schrementi; Stephanie Zimmerman

Nearly 1 out of every 4 patients admitted to hospitals across the nation for heart failure will be readmitted within 30 days of discharge. The objective of this research study is to identify the 30-day readmission rates of heart failure patients among different hospitals in Illinois. The 30-day readmission rate is defined as heart failure patients who have an unplanned readmission to an acute care hospital within 30 days of discharge from a hospitalization. Several Illinois hospitals were reviewed by region, with various hospitals included from each region. According to recent quality initiatives, hospitals should have a twenty-percent or lower readmission rate to be considered satisfactory. The hospitals reviewed were compared to this standard and a gap analysis was created. Recommendations were then made based on the gap analysis results.

UNDERSTANDING FOOD PANTRY/PARTNER NEEDS OF MIDWEST FOOD BANK

Group Leader	Sparks, Reyna Undergraduate, Health Sciences
Group Members	Terra Rumer, Undergraduate, Health Sciences; Kayla Boyd, Undergraduate, Health Sciences; Maddie Culbertson, Undergraduate, Family and Consumer Sciences
Mentor	Prof. Jackie Lanier
Authorship	Reyna Sparks; Terra Rumer; Kayla Boyd; Maddie Culbertson

The purpose of this study was to explore the diverse demands of non-profit organizations receiving aid from Midwest Food Bank for the purpose of distributing to various food insecure communities. According to the U.S. Department of Housing and Urban Development 1 in 6 Americans experience food insecurity, which is 12.3% of the population. In Illinois, 11.1% of household's experience food insecurity (Illinois Hunger Coalition, 2017). We need to ensure there is access to nutritional foods that can be acquired in socially acceptable ways. The main questions that were addressed during this study were: To what extent is Midwest Food Bank satisfying the nutritional needs of their distribution partners? How do nonprofit organizations accommodate the food security needs of their communities' demographics? Methods used to create a needs assessment included observation of different local food pantries and surveys and interviews from the local food pantry administrators in order to assess the food demands of their respective communities and other organizational needs. In the end, we were able to come to the conclusion of what these local partners of Midwest Food Bank need in order to meet their specific demographics. We were able to use our resources to create a needs assessment that can continue to be used for other nonprofit organizations that Midwest Food Bank partners with.

ASSESSING THE NEED AND INTEREST FOR A MOBILE FOOD PANTRY

Group Leader	Tisch, Alexandra Undergraduate, Health Sciences
Group Members	Peyton Pelletier, Undergraduate, Health Sciences; Allison Myhre, Undergraduate, Health Sciences; Thomas Hogan, Undergraduate, Health Sciences
Mentor	Prof. Jacqueline Lanier
Authorship	Alexandra Tisch; Peyton Pelletier; Allison Myhre; Thomas Hogan

The purpose of this needs assessment was to determine whether key stakeholders should create a mobile food pantry that would provide the West Bloomington community (known food desert) a way to access healthy foods and learn how to make quick healthy meals. Key questions answered through this assessment included: Is a mobile food pantry needed? If it is needed, how will it be utilized, how often will it be offered, and what are the items that are needed by the residents. To answer these key questions, interviews were conducted with community residents and local organization representatives currently engaged in food access/relief efforts. In addition, researchers surveyed local residents who would potentially utilize the mobile food pantry.

YOUR EXISTENCE IS INAPPROPRIATE: YOUTUBE'S RESTRICTED MODE AND THE ERASURE OF LGBTQ CONTENT

Group Leader	Trew, Hannah Graduate, Communication
Group Members	Emily Raschke, Graduate, Communication
Mentor	Prof. John Baldwin
Authorship	Hannah Trew; Emily Raschke

In the midst of the launch of YouTube's newest feature, Restricted Mode, many content creators and viewers discovered that almost all of the content that was advertised as LGBTQ or discussed LGBTQ themes became blocked and demonetized. Because of this, content creators and viewers from around the world began sharing their stories and offering their reactions to the faux pas YouTube became a part of. This study explored the potential advantages and disadvantages of YouTube's Restricted Mode, revived the discussion of discrimination and censorship of the LGBTQ community, and uncovered how Restricted Mode influenced the perceived sense of community among LGBTQ users. Ten reaction videos and comments on those videos were analyzed using thematic analysis (Braun & Clarke, 2006). Data analysis revealed two categories of reactions: reactions that highlighted the advantages of Restricted Mode and reactions that highlighted the disadvantages of Restricted Mode. We conclude by further discussing these categories, as well as LGBTQ discrimination and censorship.

USING TWITTER TO DISCUSS WORK: FUNCTIONS OF EMPLOYEES' TWEETS

Group Leader	VanCleave, Morgan Undergraduate, Psychology
Group Members	Katie Kresse, Undergraduate, Psychology
Mentor	Prof. Kimberly Schneider

Research indicates that people are increasingly using social media and other communication technologies both inside and outside the workplace (Walden, 2016). In a recent study, workplace satisfaction was examined through the use of social media on the job and employees' satisfaction was positively associated with the amount of time spent on Facebook chatting with co-workers (Robertson & Kee, 2016). The researchers also explored differences between full-time and part-time employees in their use of social media for work purposes and they reported that part-time employees used social media more frequently than full-time employees, partly to stay in contact with their co-workers. This research has implications for using social media as a platform to increase employees' satisfaction. Another study explored the risks and benefits of workplace social media and its effects on an organization's reputation. Dreher (2014) found that employees function as brand ambassadors on social media for their organization. Everything they say and do online creates a reputation for the company. Such research may aid in setting specific guidelines and managing social media use in the workplace. Opgenhaffen and Claeys (2016) assessed the extent to which organizations allowed social media use at work, how these social media guidelines were put into place and upheld, and how this use could benefit the organization. They found that most organizations believe that social media use can have positive implications in the workplace, but only when it is monitored. Many employers believed that posting messages created by the organization was better than having an employee create their own messages in order to maintain a certain organizationally-approved reputation. Whereas previous research has focused on exploring social media use for work and related guidelines, there is still little research on the purpose or goals of employees' use of social media and the potential motivational aspects of its use. The current study examines Twitter data collected through the Illinois State University SMACC Lab. We will search for work-related keywords and examine the relative frequency of positive versus negative content in the tweets. We will also code the information included in these tweets based on categories such as: organizational-related communication, work behaviors, professional communication, and coworker interactivity. Demographic information (e.g., work status, gender, age) will be retrieved, when available, from public accounts to examine potential group differences in use of these various categories in tweets.

FEASIBILITY OF INSTALLING SOLAR PV PARKING CANOPIES WITH ELECTRIC VEHICLE CHARGING STATIONS ON ISU'S PARKING GARAGES

Group Leader

Ward, Kevin

Undergraduate, Technology

Group Members

Tom Flahaven, Undergraduate, Technology; Tom Kelly, Undergraduate, Technology; Austin Bushur, Undergraduate, Technology

Mentor

Prof. Jin Jo

The need for clean energy production is increasing due to our society's high energy consumption, decreasing fossil fuel reserves, and growing environmental issues. Implementation of renewable energy systems on campus would best represent the university's values in sustainability. In our research, we analyzed three possible locations to determine the feasibility of installing parking canopies coupled with solar photovoltaic (PV) systems and electric vehicle (EV) charging. We studied the trend and growing demand towards electric vehicles. We examined different solar panels and mounts to find the most optimal combination for our study. Through our field studies and use of simulation tools we were able to obtain estimations of both the costs, the energy production of the systems, and carbon emissions saved. As a result of our above research we selected three viable locations to offer PV-EV parking canopies. We performed cost-benefit analysis at each location to provide useful energy production and financial data to determine the optimal location. With our findings, the implications will be that we can present our research to the university who will be able to see if and where solar PV canopies are feasible on campus using parking garage space. The implementation of solar PV and EV charging stations combined gives the university the ability to implement clean, renewable energy in order to show their commitment to sustainability as well as promoting students, commuters and faculty to switch from gas powered vehicles to EV.

THE EFFECTS OF NEGATIVE PERCEPTIONS PUT ON PARENTS OF CHILDREN WITH AUTISM SPECTRUM DISORDER

Group Leader	Wilhelm, Alyssa Undergraduate, Psychology
Group Members	Korrie Cassata, Undergraduate, Psychology
Mentor	Prof. Suejung Han
Authorship	Samantha Hawkinson; Korrie Cassata; Ana Roman; Suejung Han

Autism Spectrum Disorder (ASD) is a developmental disability that is becoming increasingly prevalent with a 123% growth during 2002 to 2010. Currently 1 in 68 children are identified as having autism (CDC, 2014). Individuals with autism often display various behaviors that the public might see as abnormal. People may misinterpret autism-related behavior for deviant behavior; consequently, parents of children with autism have reported feeling excluded, isolated, and stigmatized as bad parents because of their child's behaviors (Kinnear, Link, Ballan, & Fischback, 2016). Parents have expressed that the difficulty of raising a child with ASD was not recognized by others due to a lack of society's knowledge concerning autism (Woodgate, Ateah, & Secco, 2008). The current study aimed to investigate whether enhancing knowledge about ASD would reduce negative perceptions toward parents raising a child with autism. Vignettes of parent-child interactions were used in which the child displayed autism-related behaviors. A three-factor survey was developed to examine participants' (N = 79) perception of parental skill, emotional reaction, and sympathy toward parent (Austin, Zinke, & Davies, 2016). Findings revealed a significant association between enhanced ASD knowledge and positive perceptions of parents. Those who were provided with knowledge about autism reported parental skill more positively and showed less negative reactions toward parents. No difference was found between conditions on sympathy level toward parents. These results provide support that enhancing knowledge about ASD can decrease negative perceptions of parents of children with autism. Interventions of raising awareness and knowledge about ASD symptoms and possible parenting options for those symptoms may be useful in reducing negative public reactions to parents of children with ASD and thus their psychological distress.

INVESTIGATING THE ROLE OF PERSONALITY, WORK STYLES, AND WORK TOLERANCE AS PREDICTORS OF EMPLOYEE PERFORMANCE

Group Leader	Williams, Elizabeth Graduate, Psychology
Group Members	Haley Hume, Graduate, Psychology; Anna George, Graduate, Psychology; Nicole Landa, Graduate, Psychology; Lydia Martin, Graduate, Psychology; Conrad Niederhauser, Graduate, Psychology; Hyunji Suh, Graduate, Psychology
Mentor	Prof. John Binning
Authorship	Elizabeth L. Williams; Lydia G. Martin; Anna George; Haley Hume; Nicole Landa; Conrad Niederhauser; Hyunji Suh

The purpose of this study is to examine personality traits, work styles, and work tolerance dimensions as predictors of job performance. The 890 participants were pooled from a concurrent study of customer service representatives for a major video streaming company. Information was collected through self-report and internal performance data on the following dimensions: work tolerance, work styles, personality characteristics, work experience, and performance criterion measures. We hypothesized that Big Five personality characteristics, particularly emotional stability and conscientiousness, as well as work styles and work tolerance would be significant predictors of job performance. The implications from these findings may contribute to future research and practice on selection and retention of employees, job analysis, and relative topics in personnel psychology literature and human resource management.