

2019 Symposium

Individual Abstracts – Afternoon Session

IS A VALUES Q-SORT A SELF-AFFIRMATION MANIPULATION?

Presenter	Acera, Imanuel Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Authorship	Immanuel Acera; Rachael Namboordiri; Daniel Lannin

Translating self-affirmation exercises into clinical activities may be useful for practitioners. The present study tested the effects of self-affirming using Q-sort vs. essay writing tasks. The Q-sort reduced fear and increased state self-esteem, but did not reduce self-stigma. Q-sorts may be useful clinical activities for bolstering self-worth.

EXAMINING THE EFFECT OF BOUNDARY STRENGTH AT HOME ON WORK-FAMILY CONFLICT-OUTCOME RELATIONSHIP

Presenter

Akter, Mahbuba

Graduate, Management and Quantitative Methods

Mentor

Prof. Tina Thompson

The research will evaluate the relationship of work-family conflict (WFC) with some of the work and family-related outcomes (i.e., life satisfaction, job satisfaction, marital satisfaction) that were derived from a thorough literature review. I will collect data from human subjects along with the evaluation of some secondary data sources. The study expects that boundary strength at home will help dual role players (e.g. work role, family role) to reduce the adverse effect of WFC. Data will be collected in early Spring 2019 and the thesis will be completed by mid-April 2019. Contributions to the literature and directions for future research will be offered.

JAPANESE MYTHOS: HOW STORIES CAN AFFECT A SOCIETY'S BEHAVIOR AND IDENTITY

Presenter

Allen, Gwendolyn

Undergraduate, Sociology/Anthropology

Mentor

Prof. Liv Stone

Do myths help cement social norms in cultures? Are popular stories taken from mythology popular because it perpetuates that social norm, or does it go against as a taboo? This research focuses on the Japanese Momotaro myth, a story about a young boy who goes on a journey to defend his land from Oni (ogres) raiders, and the uchi-soto norm. Uchi-Soto is the norm of separating the outside from the inside. This is done in different ways; an example being taking shoes off before entering the house or school, it is also a mentality of in-group and out-group distinction. This research asks: What can an examination of the usage of the myth Momotaro throughout points in time in anime, children's literature, and war propaganda tell us about the roles of myth in the perpetuity of social norms such as uchi-soto?

DOES (DIS)TRUST PLAY ANY ROLE IN ETHNIC TENSION IN CHITTAGONG HILL TRACTS?

Presenter

Almamun, Zunaid

Graduate, Politics and Government

Mentor

Prof. Michaelene Cox

The Chittagong Hill Tracts (CHT) region of Bangladesh has been witnessing intermittent clashes between tribal and Bengali communities and political groups over a long period of time. People from both tribal and Bengali communities have lost their assets and lives in those conflicts. In the post-liberation war period in Bangladesh since 1972, CHT has maintained to be a place of contention and conflict. There are 11 ethnic groups in CHT residing in this region from the 16th century. After the liberation war of Bangladesh, the representatives of these ethnic groups led by M.N. Larma, founder of the regional political party named Parbatya Chattagram Jana Sanhati Samiti (PCJSS), met the then Prime Minister of Bangladesh Sheikh Mujibur Rahman with four points demand of autonomy with own legislature for CHT, retention of CHT regulations act 1900 in CHT, Continuation of Circle Chief offices, and restriction on the influx of Bengali people from plain lands. The state's denial of their demands led the ethnic groups to form a peace force named 'Shanti Bahini' in 1976. They began an armed insurgency against the government of Bangladesh in 1977. Consequently, Bangladesh Army was deployed to counter the insurgency that led to violent ethnic conflict which formally came to end in 1997 through signing the Chittagong Hill Tracts Accord between PCJSS and the government of Bangladesh. However, sporadic violence among various actors is continuing in CHT.

Although it is widely discussed in literature that the inadequate and incomplete implementation of CHT accord has laid ground for continuing violence and tension in CHT, thus threatening human security, however, I tried to explore whether '(dis)trust' has been understood as a social context by the scholars in explaining this human security issue. Exploring a significant number of available English literature, it is found that there is a gap in existing literature in understanding the issue of (dis)trust regarding the continuation of ethnic tension.

This is qualitative research that follows a constructivist approach that argues that the act and performance of actors in a given condition are driven by social context. Taking community security as an aspect of UN human security approach, I argue that dis(trust) is the social context that drives the actions of the actors in the context of CHT.

ROLE OF PROGESTERONE METABOLITES IN THE REGULATION OF THE EMBRYONIC ENDOCRINE ENVIRONMENT IN CHICKEN EGGS

Presenter	Angles, Rachel Undergraduate, Biological Sciences
Mentor	Prof. Ryan Paitz
Authorship	Rachel Angles; Ryan Paitz

Exposure to steroids and environmental chemicals during embryonic development has the potential to elicit effects that are permanent and persist throughout one's lifespan. During development, the extraembryonic membranes can protect the embryo by metabolizing drugs, chemicals and steroids. We hypothesized that these metabolic processes are regulated by metabolites of progesterone such as pregnanedione. To test this hypothesis, we injected 50 μg of pregnanedione into eggs at the time they were laid and quantified steroid levels in the egg on different days of development. We show that for almost all steroids, there is a significant drop in the steroid content of the egg by day six of development. We also show that injecting pregnenedione into eggs causes elevated levels of not only pregnanedione on day four of development, but also progesterone and pregnenolone. Unexpectedly, eggs injected with pregnanedione had significantly decreased steroid levels by day eight of development. This shows how pregnanedione affects the early endocrine environment and consequently embryonic growth. The hypothesis is thus supported that pregnanedione plays a role in the mechanisms underlying the regulation of the extraembryonic barrier.

EXPLORING MICROAGGRESSIONS AMONG TRANS POPULATIONS: EFFECTS ON FEELINGS OF SOCIAL EXCLUSION

Presenter	AuBuchon, Stephanie
	Graduate, Psychology
Mentor	Prof. Leandra Parris
Co-Mentor	Prof. Eric Wesselman

Those who identify as transgender face subtle discrimination in the form of microaggressions, which are behaviors and statements, often unconscious or unintentional, that communicate hostile or derogatory messages, particularly to members of marginalized social groups (Nadal et al., 2016). This study explored the microaggressions that transgender participants experience and the psychological effects on their feelings of social exclusion. Specifically, we hypothesized that transgender individuals experience microaggressions that make them feel socially excluded. The participants' ages ranged from 18-66 and identified as nonbinary, agender, demiboy, genderqueer, male, or female. The study used an online survey that had the participants recall memories of microaggressions or a control, and then they rated their emotional responses to those experiences. The results showed that transgender individuals experience a variety of complex microaggressions, which can cause feelings of significant social exclusion. Different types of microaggressive experiences can significantly impact feelings of relational value. Due to the complex nature of these microaggressive experiences and severe feelings of social exclusion, there may be a variety of mental health impacts that transgender individuals are experiencing.

MECHANORECEPTOR INVOLVEMENT FOR MAGNETIC FIELD TRANSDUCTION IN THE NEMATODE *C. ELEGANS*

Presenter	Bainbridge, Chance Graduate, Biological Sciences
Mentor	Prof. Andrés Vidal-Gadea
Authorship	Chance Bainbridge; Baylee Paluzzi; Kehinde Owoyemi; Taiyelolu Owoyemi; Andrés Vidal-Gadea

Many organisms, from bacteria to mammals, rely on the magnetic field to navigate their environment or perform impressive feats of navigation such as intercontinental migrations. Despite magnetic orientation being prevalent across taxa, the cellular and molecular mechanisms for magnetic field transduction in animals remain poorly understood. A favored model for magnetotransduction proposes that magnetic particles or proteins are coupled to force-sensitive channels (mechanoreceptors) that transduce the force of magnetic particle motion through the magnetic field as electrical signals for a sensory cell. The functional versatility and recruitment of mechanoreceptors for transduction of diverse sensory modalities like touch, gravity, and sound makes them promising candidates as potential magnetoreceptors. Furthermore, the mammalian mechanoreceptor PIEZO-1 was recently modified to respond to magnetic fields to artificially stimulate cells, suggesting it already has the appropriate structural and functional components necessary for magnetotransduction. To date no magnetoreceptor has been identified in any animal.

Here, I use the small nematode *C. elegans* to investigate the role of mechanoreceptors in magnetotransduction. *C. elegans* detects and orients to magnetic fields and has the first identified pair of magnetosensory neurons (AFDs). Furthermore *C. elegans* has a small number of mechanoreceptors (~50), many with known expression patterns. *C. elegans* therefore uniquely positions us to determine mechanoreceptor involvement in magnetotransduction. To approach this question, I used RNA silencing to reduce the expression of mechanoreceptors and assess their necessity for magnetic orientation. This approach revealed that the candidate magnetoreceptor (and PIEZO-1 orthologue), *pezo-1*, is required for magnetic orientation. To determine proximity of mechanoreceptors to magnetosensory neurons I will label the cellular and subcellular expression of putative mechanoreceptors using genetically encoded fluorescent markers. Our results not only have the potential identify the first magnetoreceptor in any animal, but will also reveal a likely conserved mechanism for magnetotransduction across magnetosensitive species.

PHYSICAL EDUCATION IN THE USA AND RUSSIA

Presenter	Bastuga, Rebecca Undergraduate, Kinesiology & Recreation
Mentor	Prof. David Thomas
Authorship	Rebecca Bastuga; David Q. Thomas

Physical Education (PE) has been an important part of K-12 curriculum around the world for many decades. It plays an important role in teaching students how to move and how to live a healthy, active lifestyle. Purpose: To compare physical education programs in Russia and the United States. Methods: Observational research was conducted in the USA and in Russia. Interviews with physical educators also took place. Investigation of published requirements was completed. Results: School systems in both countries are similarly divided into three levels. Physical education classes are required three days per week, from 1st to 11th grade in all of Russia (World Data of Education). In the US, PE is regulated by each state, not nationally (Shape America). Russia also has schools specifically for sport, called Gymnasias. These types of schools place sports before general education classes. Schools like this do not exist in the United States. Another form of a school in Russia is a Lyceum, which is a private institution that focuses on a specific topic (Education USA). Schools like this also do not exist in the United States. With so many different forms of schools in Russia, it can be hard to set a PE curriculum. The set curriculum that does exist is very similar to the United States. They include invasion games, dance and gymnastics, swimming and diving, and other activities found in American PE classes. A major difference however, are the differences in school facilities. On average, PE facilities in the US are newer, better equipped, and safer. Conclusion: Russia and the United States have similar programs of study for their PE classes. Both countries have methods they can learn from each other to better their students' physical fitness and health.

QUANTUM INTERFERENCE ENHANCEMENT OF THE SPIN-THERMOPOWER

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

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

MODIFIED FAUNAL REMAINS FROM THE EARLY LANGFORD TRADITION SITE OF NOBLE-WIETING

Presenter	Boone, Josh Undergraduate, Sociology/Anthropology
Mentor	Prof. G. Logan Miller
Co-Mentor	Prof. Abigail Stone
Authorship	Joshua Boone

Excavation of the early Langford Tradition site of Noble-Wieting (11ML24) in McLean County, Illinois has turned up several artifacts of modified bone. Faunal analysis has been undertaken to determine if the modified bone found resembles the bone tools found at other Langford Sites in the region. I hypothesize that that the bone artifacts found will indeed resemble the finds of other sites. The Life Behavior Model of Behavioral Archaeology will be applied to research. The model attempts to describe the behavioral lives of objects that start from the acquisition of the raw materials, through manufacture and use, until the object finally enters the archaeological record. By applying this model alongside Chaine Operatoire, the analysis of artifacts which determines the different steps of production to reconstruct past behaviors, should result in determining the differences or similarities between the different Langford Tradition sites and expand upon our current understanding of the relationships between humans and their environment. To categorize the different types of modified bone and bone tools, they will be separated by animal, modification type, bone type and once separated by tool type, measurements will be taken to determine the variation in morphology. Preliminary findings suggest that the bone tools and modified faunal remains are similar to the site located on the DuPage River in Northeastern Illinois yet differ from the Keeshin Farm site.

HEALTH BELIEFS AND HEALTHY EATING AND REGULAR EXERCISE: A MODERATING ROLE OF AUTONOMOUS MOTIVATION

Presenter	Boros, Rachel
	Graduate, Psychology
Mentor	Prof. Suejung Han

This study examined regulatory motivation as a moderator on the association between health beliefs and health behaviors (i.e., healthy eating [HE] and regular exercise [RE]). HE/RE are associated with positive health and psychological adjustment outcomes (e.g., Martins, Morgan, & Truby, 2008). Promoting HE/RE thus is consistent with the historical mission of Counseling Psychology, promoting growth and adjustment (Raque-Bodgan, Torrey, Lewis, & Borges, 2012). Applying the theory of planned behaviors, we predicted that positive attitudes towards, perceived norms for, and perceived control over HE/RE would be associated with HE/RE (Fishbein & Ajzen, 2010). However, beliefs do not always lead to behaviors. Applying self-determination theory (Deci & Ryan, 2000), we predicted that autonomous (i.e., intrinsic and identifying with the value of behavior) motivation predicted HE/RE and moderate the beliefs-HE/RE association. Thirty-three college students have completed Health Beliefs measure (Fishbein & Ajzen, 2010), Treatment Self-Regulation Questionnaire (Ryan & Conell, 1989), and health behavior questions. Data collection is underway. Two preliminary moderated regression analyses partially supported the hypotheses. First, positive attitude, perceived control, and autonomous motivation predicted HE, $R^2 = .44$, $F(4, 23) = 4.49$, $p = .008$, but no moderation effect of autonomous motivation was found, $F(3,20) = .38$, $p = .771$. Second, perceived control predicted RE, $R^2 = .39$, $F(4, 25) = 4.01$, $p = .012$, but autonomous motivation moderated the association between attitude/perceived control and regular exercise, $F(3,22) = 3.47$, $p = .03$. Full results and conclusions will be presented at the conference.

HEAT WAVE TIMING, CONTINUITY, AND LENGTH AFFECT TEMPERATURE-DEPENDENT SEX DETERMINATION IN A FRESHWATER TURTLE

Presenter	Breitenbach, Anthony Graduate, Biological Sciences
Mentor	Prof. Rachel Bowden
Co-Mentor	Prof. Ryan Paitz
Authorship	Anthony Breitenbach; Amanda Wilson Carter; Ryan Paitz; Rachel Bowden

Climate change has the potential to threaten thermally sensitive species, such as reptiles with temperature-dependent sex determination (TSD), if heat waves increase in frequency and length as predicted. In species with TSD, temperature affects sex determination most acutely during the thermosensitive period (TSP), which falls in the middle third of development as defined by constant temperature studies. Presently, we know little about how the timing during development or continuity of heat waves affects sex determination. We hypothesized that exposure to daily fluctuations of $25\pm 3^{\circ}\text{C}$ (which produce all males) and heat waves of $29.5\pm 3^{\circ}\text{C}$ that varied in either timing during development or continuity would affect resulting sex ratios in *Trachemys scripta*. Exposure to a 15-day heat wave early or late in development did not significantly affect sex ratios (all male-biased), but heat waves occurring between days 24 and 45 resulted in an average sex ratio of 80% female. Further, the observed TSP was shorter than the TSP defined by constant temperature studies. Only the 12-day heat wave early in the TSP produced a female-biased sex ratio in the continuity study. Decreasing continuity resulted in male-biased sex ratios, resulting from continuity effects or lowered sensitivity later in the TSP. We also quantified *Dmrt* and aromatase expression following 6, 9, 12, and 16 days of heat wave exposure to determine how heat waves affect gene expression. Aromatase expression was significantly up-regulated after 12- and 16-day heat waves, while *Dmrt1* expression did not significantly change over the course of the heat wave. These results clarify the timing and length of the TSP and provide information on the timing of up-regulation of aromatase expression under fluctuating conditions. Further, these data provide detailed insight into the physiological effects of climate change, in the form of heat waves, on species with TSD.

MONITORING PROTEIN EXPRESSION OF LEUCYL-TRNA SYNTHETASE PARALOGS IN SULFOLOBUS ISLANDICUS THROUGH PRODUCTION OF SPECIFIED ANTIBODIES AND GENOMIC MARKER CONSTRUCTS

Presenter	Bretz, Nicholas Graduate, Biological Sciences
Mentor	Prof. Christopher Weitzel
Authorship	Nicholas M. Bretz; Christopher S. Weitzel;

The aminoacyl-tRNA synthetases are an ancient and ubiquitous class of proteins that perform an essential molecular function. These proteins are tasked with linking an amino acid to the 3'-acceptor end of a cognate tRNA in a process referred to as aminoacylation. This "charged" tRNA is then delivered to the ribosome where the amino acid is assimilated into a growing polypeptide chain. It was once thought that each organism would contain a single synthetase per standard amino acid. However, we have found a whole family of organisms, the Sulfolobaceae, within the Crenarchaeota domain of the Archaea that harbors a conserved and full-length duplication of leucyl-tRNA synthetase (LeuRS). While one paralog, LeuRS-F, exhibits functions associated with canonical LeuRS, we have yet to detect charging activity from the duplicate, LeuRS-I. Therefore, it is possible that LeuRS-I has evolved to confer a novel function particularly beneficial to the Sulfolobaceae making the elucidation of this paralog's cellular role of paramount importance. Information regarding the expression of these enzymes during the growth of *Sulfolobus islandicus* could help decipher their functional relevance in the organism's life cycle, but requires the development of reliable and consistent methods for detecting and discerning between LeuRS-F and LeuRS-I. Sequence alignments between the two enzymes reveals 40% overall sequence identity between the two paralogs, with this identity decreasing to 20% at their C-terminal domains. Due to the divergence, this region of LeuRS-I was utilized for the production of polyclonal antibodies. As a concurrent and alternative route, we have also begun genetically engineering a fusion of LeuRS-I with a C-terminal hemagglutinin (HA)-tag on the chromosome of *S. islandicus*, while we already have obtained a chromosomally encoded fusion of LeuRS-F with a C-terminal FLAG-tag. Preliminary efforts at monitoring LeuRS-F and LeuRS-I's protein expression patterns in *S. islandicus* will be presented.

THE ROLE OF P38 MAPK PHOSPHORYLATION IN AGING

Presenter	Brewer, Deja Undergraduate, Biological Sciences
Mentor	Prof. Alysia Mortimer
Authorship	Deja Brewer; Crystal Jones

Aging affects most organisms on our planet and is a factor in many diseases, yet we still do not fully understand the factors involved. Our lab developed a model of aging by manipulating the p38 MAPK (p38Kb) gene in *Drosophila melanogaster* (fruit fly). Over-expression of p38Kb results in a 37% lifespan extension whereas loss of p38Kb results in a reduced lifespan. The activation of p38Kb is regulated by its dual phosphorylation on the threonine and tyrosine of the TGY motif. We are interested in how p38Kb phosphorylation contributes to lifespan and other aging phenotypes. To do this, we are making transgenic flies that are phospho null for p38Kb in which the T and Y are mutated to alanine (p38Kbala2). As alanine cannot be phosphorylated, this substitution makes a form of p38Kb that cannot be phosphorylated. In addition, we are also making flies that are phospho mimic for p38Kb in which the T and Y are mutated to aspartic acid (p28Kbasp). Aspartic acid has a negatively charged side chain that mimics the structure/charge of a phosphorylated threonine or tyrosine. As a result, the protein can behave as though it is phosphorylated even when it is not. Here, we will discuss our cloning strategy for making these transgenic flies. Once we have our mutations in the final vector, we can then observe their effects on lifespan and aging phenotypes such as locomotor functions.

TECHNOLOGY IN THE CLASSROOM: NEARPOD PARADIGM AND LEARNING OUTCOMES

Presenter	Buhay-Castro, Jaclyn
Mentor	Undergraduate, Psychology
Authorship	Prof. Julie Campbell
	Jaclyn Buhay-Castro; Julie Campbell

Purpose:
Previous research has shown that students report using their devices even if the use of devices has been forbidden (Morphyt, 2015). Restricting the use of personal devices in the classroom may be ineffective. Additionally, students feel constrained by traditional lecture methods (Atas & Delialioğlu, 2017). Technology, such as Nearpod, allows instructors to reach out to students using new teaching methodologies. This project examines the effect of a teaching paradigm on college students' learning outcomes. Several classroom behaviors were recorded to see if there is any effect of teaching methodology on students' participation in class activities.

Procedure:
Two sections of the fall 2018 Adolescent Development course (PSY 302) at Illinois State University were observed for this project. The "PowerPoint" section did not use technology/Nearpod and only PowerPoint slideshows were presented in class. The "Nearpod" section did use technology/Nearpod for student interactions. Each session had a total average of 39 students attending lecture. Every class session, student behaviors were recorded, including attendance, hand raising, asking questions, making comments, and using a device for a purpose not related to class. Every 15 minutes, additional student behavior was recorded to see if students were participating in the class material or using a device for an unrelated activity. At the end of the semester, a proportion of each of the observed behaviors was calculated for each class section.

Results:
A multivariate analysis of variance was performed to examine the effect of the independent variable, instruction methodology, on the six dependent variables. There was a statistically significant difference in hand raising based on class section, $F(1, 46) = 8.04, p < .025$; partial $\eta^2 = .15$. Students in the Nearpod section raised their hand significantly more often (25%) than those in the PowerPoint section (11%). Similarly, significant results were found for students asking questions and device usage. There were no significant differences in attendance or making comments between the two sections.

Conclusion & Implications:
An increased amount of hand raising and question asking indicates that students in the Nearpod section were found to engage in class more than students in the PowerPoint section. These results indicate that using technology in the classroom, specifically Nearpod, enhances teaching and engages students. The implications are that this application may be a useful way to increase student participation in a classroom setting at the university level.

THE LONG-LASTING PRESENCE OF MUSICAL PROCEDURAL MEMORY IN PIANO PLAYING ADULTS WITH DEMENTIA

Presenter	Busch, Bethany Graduate, Music
Mentor	Prof. Cindy Ropp
Authorship	Bethany Busch

Dementia affects many different types of memory in both musicians and non-musicians. However, research on musicians diagnosed with dementia found that musical procedural memory remains intact even into moderate and severe dementia. This study was designed to research existing musical procedural memory in musicians diagnosed with mild to moderate dementia. Three clients were contacted from two different memory care facilities. The clients' cognition levels were assessed using the Mini-Mental State Examination (MMSE) which indicated the severity of their dementia. Two out of three of the clients were put into the moderate dementia stage while one of the clients was on the border between mild and moderate dementia. Over the course of three meetings, the researcher administered the MMSE, prompted the clients to play a piece that was familiar, and to sight read new music. While none of the clients could identify the year, season, or the day of the week, they all demonstrated a level of proficiency on the keyboard. Client A was a 74-year-old woman who had mild dementia. She started taking piano lessons as young girl and stopped taking lessons when she attended junior college. During the study, she read music slowly but navigated various keys and accidentals with the right hand. Client B was a 99-year-old woman with moderate dementia. She started taking piano lessons at eight-years-old. She stopped taking lessons prior to high school. During the study, she read simple melodies most effectively with the right hand and navigated accidentals and key signatures fluidly. Client C was a 98-year-old woman who had moderate dementia. She did not begin taking lessons until she was in her 70's. During the study, she did not read music, but she began playing a C major scale with correct scale fingering. Although the participants with earlier experience on the piano demonstrated more muscle memory for reading music and playing melodies, all three participants demonstrated that their brains retained musical procedural memory in both mild and moderate stages of dementia.

CREATION OF FALSE MEMORIES

Presenter	Chapman, Sierra
	Undergraduate, Psychology
Mentor	Prof. Dawn McBride
Authorship	Sierra Chapman

Numerous studies have been conducted on how people remember information. In the current study, the focus was to examine how some types of false memories are created through related lists. Each participant is presented with lists of words that are all related to an overall theme (like bat and homerun) or phonologically (like bat and cat) that is not presented in the lists (called a lure). List memory is then tested in a short-term memory (STM) task or a long-term memory (LTM) task. In the STM task, the participant is asked to study short lists of words (6 words per list) and is given a recognition test with a single item right after the list or after the participant repeats a random number out loud to clear their working memory. In the LTM task, the participants study the lists (either with or without the repeating number after each list) and then receives a longer recognition test at the end. Our predictions for the results of this study are that error rates (incorrectly recognizing the lure items) depend on whether the repeating number task is done and whether that participant receives a STM or LTM test. Within the results, we are looking to see if people more often incorrectly recognize semantically related words or phonologically related words across the different conditions.

RECREATING COMMUNITY ACTIVITIES AT MOUND HOUSE THROUGH MICROWEAR ANALYSIS

Presenter

Chapman, Silas
Graduate, Sociology/Anthropology

Mentor

Prof. G. Logan Miller

Understanding the Hopewell phenomenon has been of considerable interest for North American archaeologists since early on in the discipline. Various Middle Woodland period (50 BCE-400CE) cultures participated in shared ideas and behaviors, such as constructing mounds and earthworks and importing exotic materials to make objects for ceremony and for interring with the dead. These shared behaviors and ideas are termed by archaeologists as "Hopewell". Considering that Middle Woodland peoples lived in small, dispersed habitations, studying the places where they came together to share ideas and reinforce their shared identity is crucial to understanding the Hopewell phenomenon. The Mound House site is thought to have served as a "ritual aggregation center", a place for the dispersed Hopewell communities to congregate at certain times of year to reinforce their shared identity. Mound House is located in the Lower Illinois River valley within the floodplain of the Illinois River, where there is a concentration of Middle Woodland sites and activity. While archaeologists think that the site served as a place for a regional Hopewell symbolic community to create and maintain their identity, little is known about the actual activities that took place at the site. Use-wear analysis is a tool that archaeologists can use to identify the materials stone tools were used to cut, scrape, drill, etc. Use wear analysis looks at forms of polish on stone tools that are specific to the types of materials that they were used to cut, scrape, etc. This method can help archaeologists understand the activities people were engaging in and what types of objects they were creating. Lamellar blades are a unique and diagnostic formal tool type of the Hopewell and have been demonstrated to been used as a multipurpose tool for a wide range of activities. This purpose of this study is to examine lamellar blades from Mound House using use-wear analysis in order to understand the types of activities people were doing there, and shed light on Hopewell ceremonialism and community practices.

EXAMINATION OF STUDENT-ATHLETES' DEVELOPMENTAL TRANSITION FROM YOUTH SPORT TO COLLEGE SPORT

Presenter	Childers, Coleman Graduate, Kinesiology & Recreation
Mentor	Prof. Scott Pierce
Co-Mentor	Prof. Tony Amorose

The majority of research in developmental sport psychology has targeted the youth and adolescent age groups (aged five to 18) and has tended to avoid athletes in organized and highly competitive environment such as major college athletics. The transition from high school to college brings many challenges. Academically and socially, students encounter increased course rigor, decreased in-class time, and adjustment to new social groups. Additionally, student-athletes encounter scrutiny from the public, extensive time commitments, and physical and mental demands as they combine athletic and academic pursuits. This on-going study explores student-athletes' perspectives of the developmental transition from youth sport to collegiate sport; specifically looking at the development and transfer of psychological skills, leadership skills, and life skills from one level to the next. An interpretivist, narrative approach is being used to understand experiences and perceptions of student-athletes who have recently completed their first year in college. At the time of writing the abstract, data collection is on-going. Thirteen student-athletes have participated in interviews that involve pictorializing a developmental timeline and responding to questions from a semi-structured interview guide. Preliminary thematic analysis has revealed initial common themes across athletes from various sports. Goal-setting is a psychological skill that most athletes participate in on their own but are not given assistance with and are not effectively set nor tracked. Interestingly, related to leadership skills, is a fear of speaking out as a first-year student-athlete on a new team, regardless of leadership roles prior. Time-management, scheduling, and proactivity are common themes of life skills that transferred in to college but were never tested to the extent that they were at the collegiate level, therefore making them more difficult to grasp. Finally, student-athletes desire further transitional support for knowing: a) how to effectively study; b) how to deal with setbacks in sport and academics; and c) knowing who and when to ask for help when needed. The findings will be used to develop resources to cultivate a smoother transition in to collegiate sports for not only the student-athletes, but parents, coaches, and support staff as well.

DIELECTRIC NANO-PHOTONICS-IV: EXCITATION OF ELECTRODYNAMIC ANAPOLES IN SILICON NANOSPHERE

Presenter

Coe, Brighton
Undergraduate, Physics

Mentor

Prof. Uttam Manna

Authorship

Brighton Coe; Daniel Eggena; Michal Szczerba; Andrew Missel;
Uttam Manna

Even though the study of non-radiating objects has been part of fundamental physics for a long time, the dynamic anapole corresponding to the time-varying oscillating charge-current distributions in the optical frequencies was only experimentally demonstrated in 2015. In this talk, I will report the results of excitation of anapole mode in isotropic nanosphere. Since plane wave illumination is not suitable for anapole mode excitation in a nanosphere, we exploited the polarization symmetry of cylindrical vector beam to excite anapole mode in isotropic nanosphere.

SPACE-TIME RESOLVED BREIT-WHEELER PROCESS FOR A MODEL SYSTEM

Presenter

Comben, Sean

Undergraduate, Physics

Mentors

Prof. Rainer Grobe; Prof. Q. Charles Su

Authorship

Sean Comben; Yingying Lu; Rainer Grobe; Charles Su

We study the creation process of an electron-positron pair as a result of the collision between two incoming photons with full spatial and temporal resolution. The dynamics of the four involved particles is described by a simplified model based on a Yukawa Hamiltonian in one spatial dimension. Consistent with lowest order perturbation theory, since only sets of four intermediate off-resonant states facilitate the coupling between the initial and final scattering states, we can adiabatically eliminate them leading to an analytical solution. This work [1] has been supported by the NSF, NSFC and Research Corporation.

[1] Y. Lu, T. Xi, N. Christensen, Q. Su and R. Grobe, Phys. Rev. A (to be submitted).

EFFORTS TOWARDS THE ASYMMETRIC SYNTHESIS OF A HUMAN T-CELL LEUKEMIA VIRUS PROTEASE INHIBITOR: PILOT REACTIONS DIRECTED TOWARDS THE FORMATION OF A GAMMA-HYDROXYL-PROLINAMIDE KEY

Presenter	Cooper, Trace Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Trace A. Cooper; Shawn R. Hitchcock

The first known human retrovirus to be discovered was the Human T-cell leukemia virus (HTLV-1). In contrast to other retroviruses such as HIV, HTLV-1 has only a limited number of occurrences of attempts to generate a specific HTLV-1 protease inhibitor (Akaji and Researchers in the United States and Japan isolated the virus). Since these findings and with adult T-cell leukemia/lymphoma in the 1980s, and since the discovery of HTLV-1 three more HTLV's have been identified. The HTLV-1 virus is endemic in southwestern Japan, sub-Saharan Africa, South America, parts of the Caribbean, and is seen in lower frequencies among many regions. Akaji followed up this work with the synthesis of a series of protease inhibitors. These inhibitors were synthesized by using the method of Ghosh and coworkers that involved a titanium catalyzed asymmetric aldol addition reaction using a toluenesulfonyl-2-indanyl valerate ester. The route was efficient and yielded the desired protease inhibitor target. However, it is proposed that a route employing an asymmetric glycolate aldol addition reaction would be more efficient due to the presence of the glycolate component. We became interested in developing a synthesis of the HTLV-1 protease inhibitor by a new pathway involving Crimmins' oxazolidine-2-thione chemistry using a glycolate approach. This project has involved conducting an asymmetric aldol reaction with a glycolate side chain. We have been able to demonstrate the success of this process as well as the very mild sodium borohydride cleavage of the sidechain (<30 minutes, room temperature). The cleavage process generates a 1,3-diol that has been chemoselectively substituted at the primary alcohol. Research is underway to exploit the sulfonate group in its nucleophilic substitution with a prolinamide derived from the commercially available N-tert-butoxycarbonyl-proline.

ONLINE REMOVAL OF VOLATILE SILOXANES IN SOLID-STATE ANAEROBIC DIGESTER BIOGAS USING A BIOFILTER AND AN ACTIVATED CARBON FILTER

Presenter	Corsolini, Summer Undergraduate, Health Sciences
Mentor	Prof. Liangcheng Yang
Authorship	Liangcheng Yang; Summer Corsolini

This study tested the feasibility of using a low-cost biofilter and an activated carbon filter to remove siloxanes from solid-state anaerobic digesters that had unsteady biogas production. The digesters were dosed with three commonly found siloxanes, D3 (Hexamethylcyclotrisiloxane), D4 (Octamethylcyclotetrasiloxane), and D5 (Decamethylcyclopentasiloxane). The removal efficiency of siloxanes by a biofilter and an activated carbon filter integrated system was compared to that using an activated carbon filter only. All solid-state anaerobic digesters were healthy throughout the 42-day test. The results showed that both methods removed siloxanes at a relatively consistent level, regardless of the fluctuating biogas yields. On average, the biofilteractivated carbon filter system showed 98.13%, 96.61%, and 78.58% removal efficiency for siloxanes D3, D4, and D5, respectively, while the ones with an activated carbon filter only gave 91.39%, 81.54%, and 69.43%. Likely, the biofilter directly captured siloxanes, or partially removed water vapor from biogas which enhanced siloxanes removal in the subsequent activated carbon filter.

FIELD TESTING OF AN MTSS PROGRAM EVALUATION MODEL: ELEMENTARY LEVEL

Presenter	Counterman, Daniel Graduate, Psychology
Mentor	Prof. Mark Swerdlik
Authorship	Daniel Counterman; Danielle Swinford; Mark Swerdlik

A program evaluation model for an MTSS organizational framework was field-tested at a local elementary school. Using an on-line survey, this formative program evaluation assessed perceptions of teaching staff and parents including the effectiveness of the various tiers of intervention. Implementation steps of the program evaluation will also be discussed.

DOES CURRENT ACTIVITY STATUS IMPACT GOAL RECOMMENDATION ADHERENCE IN A WORKSITE WALKING INTERVENTION?

Presenter	Czerwinski, Annalise Undergraduate, Kinesiology & Recreation
Mentor	Prof. Anna Miles
Authorship	Annalise Czerwinski; Anna Rinaldi-Miles; Ann Miller

Setting is a common motivational technique used by many people when trying to increase their current physical activity habits. However, it can be difficult for people to realistically set goals based on their current and past activity experiences.

PURPOSE: The purpose of this study is to examine if adherence to goal setting recommendations differ between active versus inactive individuals. **METHODS:** Adult participants (N=38) enrolled in a four week worksite walking intervention first completed a survey assessing demographic information and stage of change to determine current activity status. Next, currently active (n=14) and inactive (n=24) participants wore blinded accelerometers for one week to obtain baseline average daily step counts. Then, participants reviewed baseline numbers with a researcher to determine daily step goals for each week of the intervention. Participants were told that setting daily goals to increase 10% each week from baseline is recommended for safe and effective step increases. After informing participants of these recommendations, they were allowed to choose their daily step goals for each week of the intervention. Goals set by participants in Week 1 were used to examine if activity status influenced adherence to the 10% step increase recommendation. **RESULTS:** A one-way between subjects ANOVA was conducted to compare the effect of activity status on Week 1 goal setting in active and inactive participants. There was a significant effect of activity status on Week 1 goal setting at the $p < .05$ level for the two conditions [$F(1, 36) = 4.834, p = 0.034$]. Post hoc comparisons using the Tukey HSD test indicated that the mean score for inactive participants ($M = 701.74, SD = 1397.81$) was significantly different than active participants ($M = -242.59, SD = 1029.58$). **CONCLUSION:** Participants who were currently inactive set their goals higher than the recommended 10% increase from baseline for Week 1 while participants currently active set their goals lower than the recommendation. Goal setting should be realistic but challenging and activity status may impact a client's desire to adhere to suggested recommendations. Considering a client's current physical activity status may be valuable to consider when advising during the goal setting process and can be applied for a beneficial rehabilitation or exercise

MATERNALLY DERIVED PROGESTOGENS INCREASE EMBRYONIC GROWTH RATES EARLY IN DEVELOPMENT IN THE CHICKEN (GALLUS GALLUS)

Presenter

Damery, Konnor

Undergraduate, Biological Sciences

Mentor

Prof. Ryan Paitz

Maternal steroid levels in chicken eggs impact embryonic development. Conditions experienced during embryonic development have the potential to produce lifelong effects. The general trend, from humans to birds, is for offspring that are larger at the time of birth to have increased survival. And in birds the best predictor of hatch mass is egg mass, where larger eggs produce larger offspring. However, we unexpectedly found that early in embryonic development (7 days of incubation), chicken embryos developing in small eggs were actually larger than those in large eggs. This led to the question: Are there yolk steroids that are more abundant in smaller eggs that could increase embryonic growth rates? To begin to answer this question, 60 eggs were collected at the time of laying for the quantification of yolk steroids prior to development. After data analysis, three progestogen steroids (progesterone, pregnenolone, pregnanedione) were found to be more abundant in smaller eggs. Based on this, we further hypothesized that supplemental injections of these progestogens would produce larger embryos after seven days of incubation. To test the hypothesis, a second experiment consisted of 60 eggs, split into two groups. The experimental group received a cocktail with steroid ratios based on the average levels found in the first 60 egg yolks (12 μ g progesterone, 120 μ g pregnenolone, and 280 μ g pregnanedione in 100 μ L oil). The control group received an equivalent volume of pure oil. Both groups were incubated at 37^o C and 65% humidity for seven days. At the end of the seventh day, it was discovered that the progestogen-injected eggs produced significantly larger embryos. These embryos were then molecularly sexed and embryonic sex did not influence embryonic mass. These findings suggest that smaller eggs contain increased levels of maternal progestogen steroids such as progesterone, pregnenolone, and pregnanedione and supported the hypothesis that these increased levels aid in developing larger embryos after one week. Future studies will investigate how maternal progestogens influence embryonic growth later in development.

DEVELOPING A CHIRAL AUXILIARY PLATFORM FOR THE ASYMMETRIC SYNTHESIS OF GAMMA-AMINO ACIDS LYRICA, BACLOFEN, AND ROLIPRAM: SYNTHESIS AND ASYMMETRIC ALDOL REACTIONS WITH AN

Presenter	Delach, Christina Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Christina Delach; Shawn R. Hitchcock

Our research group is focused on the development of synthetic methodologies that allow for the synthesis of enantiomerically enriched materials. The primary reaction that we have investigated is the asymmetric aldol addition reaction. We developed a chiral template for this reaction from enantiomerically pure materials such as the Ephedra alkaloids and alpha-amino acids. Once prepared, these compounds are known as oxadiazinones and they can serve as templates for the aldol reaction. The success of the asymmetric induction in the oxadiazinone mediated aldol reaction is believed to be due to the stereogenic N4-nitrogen. This is based on the observed diastereoselectivities for the asymmetric aldol reaction which ranges from 3:1 to 99:1 when the N4-substituent is a sterically undemanding methyl group, and ranges from 10:1 to 99:1 when the N4-substituent is a more sterically demanding isopropyl group. The conformation and, consequently, the configuration of the N4-nitrogen is a result of chiral relay where stereochemical information is relayed from the C5 and C6 positions of the oxadiazinone ring system. The diastereoselectivity of the asymmetric aldol increases as the steric demand of the N4-position increases. However, the ease of the cleavage of the newly formed asymmetric aldol chain becomes compromised. We determined that it would be of more value to have a stereodirecting N4-group that could be removed under oxidative conditions so as to facilitate the cleavage of the side-chain. We were able to prove this proposed ideal with an oxidatively sensitive p-methoxyphenyl group. However, this group is not sterically demanding. To further pursue this chemistry, we have engaged in the synthesis of an N4-2-naphthylmethyloxadiazinone. This group is more sterically demanding and is expected to enhance the diastereoselectivity of the overall asymmetric process. This poster presents the work that has been achieved thus far in the development of a new class of oxadiazinones and their ultimate usage in the synthesis of gamma-amino acid Lyrica.

CONFRONT OBESITY: CLASSROOM-BASED PHYSICAL ACTIVITY BREAKS FOR PRESCHOOL CHILDREN

Presenter	DeLew, Leah Graduate, Psychology
Mentor	Prof. Adena Meyers
Authorship	Leah DeLew; Adena B. Meyers

Is there an achievement gap in obesity? In 2014, the CDC reported a disproportionately high obesity rate (14.5%) among preschool aged children from low-income families in the United States. We will present the results of a needs assessment regarding a Head Start location's initiative to increase the physical activity of preschool-aged children. Practitioners will learn about a simple, evidence-based practice to confront obesity in schools: classroom-based physical activity breaks.

CORRELATED TEMPERATURE RESPONSES SUPPORT ROBUST ACTION POTENTIAL TIMING

Presenter	DeMaegd, Margaret Graduate, Biological Sciences
Mentor	Prof. Wolfgang Stein
Authorship	Margaret DeMaegd; Wolfgang Stein

Temperature-robust timing of action potentials is essential for neuronal communication and a prerequisite for learning and behavior. The timing of action potentials relies primarily on the coordination of action potential initiation between neurons and the maintenance of that timing along the length of their axons. Ion channels, imperative to both of these processes are affected by changes in the animal's internal and external temperature. Additionally, ion channel numbers and responses to temperature may differ between neurons. Yet, many animal behaviors are robust to temperature fluctuations, suggesting that the sites of action potential initiation as well as axons have mechanisms to maintain coordinated timing. This is particularly important when axons differ in their diameters, as axon diameter determines ion channel number. Mechanisms that support precisely timed action potential initiation between different neurons have been identified, but no such mechanisms have been identified for axons despite their essential role in maintaining timing.

To determine if axons have mechanisms to maintain timing we utilized the crustacean pyloric circuit - a system where action potential timing at the initiation sites is temperature-robust. It is not known, however, if timing is maintained along the several centimeter long axons, which project into the periphery to activate the muscles involved in the associated behaviors. Our results indicate that despite the velocity along each pyloric axon being different at any given temperature, velocity increases by similar relative amounts in all axons as temperature increases. This suggests that the pyloric axons have similar ion channel properties but differ in their diameter. Surprisingly though, we find that within a limited range of physiological temperature range, the pyloric axons do maintain action potential timing.

To predict the mechanisms by which axons of different diameters, including pyloric axons, can maintain action potential timing when temperature changes, we developed a computational model that allowed us to independently vary ion channel properties and compare timing between different axons. Our model results show that the temperature influence on velocity strongly depends on how much temperature affects the activation gate of the Sodium channel. Specifically, the ratio of temperature influences on the activation gates between two different diameter axons bests predicts how those two axons will maintain action potential timing: Action potential timing is best maintained over the largest temperature range if the smaller axon is more strongly affected by temperature than the larger one. Consequently, temperature-robust action potential timing requires coordination between axonal intrinsic properties.

HOW EMPLOYMENT STATUS INFLUENCES READINESS TO CHANGE IN YOUTH

Presenter
Deutsch, Elizabeth
Graduate, Psychology

Mentor
Prof. Leandra Parris

Authorship
Elizabeth Deutsch; Sarah Koppenheofer; Joel Dukett; Leandra Parris; Daniel Lannin; Ani Yazedjian

There has been an international call to equip students with skills necessary to find and maintain employment. As part of a program for at-risk youth, students received job training and completed surveys about readiness to change employment behaviors. Results indicated that students significantly increased their readiness to change, and employed youth had greater readiness compared to those who were unemployed. Implications for practice will be discussed.

AN ANALYSIS OF ECONOMIC INSECURITY

Presenter

Diblich, Irene

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

This research project is one of a series of individual photo essays undertaken to explore current or potential human security threats at the local level. The essay focuses specifically on economic dimensions related to risks to individual well-being and dignity in Bloomington-Normal. Often overlooked, these economic dimensions reveal prevalent issues in the community such as poverty, unemployment, and limited health accessibility. Studies in human security are generally regarded as interdisciplinary frameworks centered on the welfare of people, rather than conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There are few studies that employ this concept at local levels within developed countries, and thus our community serves as a site of inquiry for this class project. My own collection of captioned photographs and accompanying narratives underscores the subjective nature in determining who defines security, what it constitutes and who is at risk, and demonstrates that perceptions of human (in) security can be made visible through arts-based research methodologies. The final project will reveal threats and vulnerabilities of the local community one may not have initially noticed without a visual analysis.

TEMPERATURE EFFECTS ON THE PROPAGATION SPEED OF ACTION POTENTIALS

Presenter

Dorsett, Nicholas
Undergraduate, Physics

Mentor

Prof. Epaminondas Rosa

Authorship

Nicholas Dorsett; Rosangela Follmann; Epaminondas Rosa

In neurons, passive membrane current flows have an important functional role in electrical signaling in nerve cells, including action potential propagation. Therefore, it becomes relevant to have a quantitative understanding of how passive current flows evolve as the action potential travels along the axon. Of particular interest in this study is the effect that temperature has on this mechanism, possibly of crucial relevance for the survival of the animal. In this study we use computer simulations to test the effect of temperature changes on the propagation speed of action potentials along the axon of a neuron. We employ a compartmental model for the axon where each compartment is connected to its two nearest neighbors via a reciprocal electrical coupling. The strength of the coupling is related to conductances which are considered as parameters in the model equations. The stronger the coupling (higher conductance values) the easier for the signal to travel on the axon. Physiological features such as diameter and resistivity of the compartment are shown to play important roles in the way the units communicate with one another. Additionally, we show experimental results exhibiting qualitative agreement with our computational output.

REFLECTION AND TRANSMISSION OF SELF-ACCELERATING WAVE PACKETS

Presenter

Dusing, Glenn

Undergraduate, Physics

Mentor

Prof. Allison Harris

Authorship

Glenn Dusing; Torrey Saxton; Allison Harris

Airy beams have been studied in an optical context since their discovery in the late 1970s and have found numerous applications in technologies such as microscopy and optical trapping. Many of these applications are based on the wave packets' unique features such as zero or minimal diffraction, self-acceleration, and self-healing. Recently, Airy beams have been produced using electrons and these matter waves exhibit many of the same unique characteristics of their optical counterparts. We use our Path Integral Quantum Trajectory (PIQTr) model to present a study of the reflection and transmission of matter Airy wave packets. Like the more familiar Gaussian wave packets, Airy beams have a Gaussian momentum distribution. However, despite this similarity, Airy beams show unique features for transmission and reflection.

ORGANISMS' USE OF A CREEK

Presenter

Edelman, Victoria

Undergraduate, Geography, Geology, and the Environment

Mentor

Prof. Catherine O'Reilly

It is obvious that organisms need water to survive. However, the less obvious question is when they get it. Scientists were studying the turbidity of the water in a stream and noticed that at certain times of the day, the turbidity was higher than others. This led to the question of what was in the creek and when. A camera was set up to capture when and what organisms were in the creek to see if it correlated with the high turbidity levels. The data that was collect early on showed there was a pattern starting to form. The camera revealed that certain animals have a tendency to come at a certain time of the day.

DIELECTRIC NANO-PHOTONICS-III: THE DISCOVERY OF ELECTRODYNAMIC ANAPOLES IN SILICON NANODISKS

Presenter	Eggena, Daniel Undergraduate, Physics
Mentor	Prof. Uttam Manna
Authorship	Daniel Eggena; Brighton Coe; Andrew Missel; Michal Szczerba; Uttam Manna

Resonant optical excitation of high index dielectric nanoparticles offers unique opportunities for reduced dissipative losses and large resonant enhancement of both electric and magnetic near-fields. In this regard, there is a 'new kid on the block', namely electrodynamic 'anapole' mode (i.e. 'without poles' in Greek. In this talk, I will discuss how high-index dielectric nanostructures under resonant excitation of the anapole mode can act as a non-radiating/radiationless source, which can confine energy efficiently by minimizing radiative loss.

SMALL MOLECULE METAL ION CHELATORS FOR PARKINSON'S DISEASE THERAPY

Presenter	Ehlbeck, Johanna Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Johanna Ehlbeck; Selena Oskard; Michael Webb

Parkinson's disease (PD) is a common neurodegenerative disorder affecting nearly 1 million Americans. Currently, therapeutic options for PD merely treat the symptoms of the disease, while the underlying cause is not actively targeted. One of the hallmarks of PD are protein deposits comprised primarily of the protein α -synuclein (α -syn). The combination of the α -syn and the redox-active metals, copper and iron, accelerate the formation of the aggregates known as Lewy bodies and promote a toxic environment. The prevalence of iron within these Lewy bodies is a promising target for chelation, as the removal of the metal ions from α -syn should promote the disruption of the problematic protein deposits. We are currently preparing several new small molecule metal ion chelators using the copper-catalyzed cycloaddition reaction between an azide and an alkyne forming a 1,2,3-triazole. Once synthesized, the compounds are characterized by Nuclear Magnetic Resonance and Mass Spectrometry. We further analyze the compounds affinity for metals by UV-Visible Spectroscopy. Following this, analysis will be done to test the ability of the 1,2,3-triazoles to disrupt or prevent α -syn aggregation. Ultimately, these chelators would be the basis of a therapeutic strategy designed to directly target the key marker of neural degeneration in Parkinson's Disease.

IMPROVING AGRONOMIC TRAITS OF THE OILSEED-PRODUCING WINTER COVER CROP PENNYCRESS (*THLASPI ARVENSE*) USING CRISPR-CAS9 GENOME EDITING

Presenter	Esfahanian, Maliheh Graduate, Biological Sciences
Mentor	Prof. John Sedbrook
Authorship	Maliheh Esfahanian; Michaela G. McGinn; Brice A. Jarvis; John Sedbrook

Pennycress (*Thlaspi arvense*) is an emerging oilseed crop closely related to Arabidopsis and rapeseed canola that holds considerable agronomic and economic potential in producing seed oil and meal to be used as food, feed, and as a biofuels feedstock. Pennycress possesses a unique combination of attributes including extreme cold tolerance, rapid growth, over-wintering growth habit, and a natural ability to produce copious amounts of seeds high in oil and protein. Pennycress could generate billions of liters of oil annually throughout temperate regions of the world without displacing food crops or requiring land use changes. For example, pennycress can be grown throughout the 40 million-acre U.S. Midwest Corn Belt during the fall through spring months, double-cropped between corn and soybeans on otherwise fallow farmland thereby providing ecosystem services of erosion and nutrients runoff control. Post oil extraction, the pennycress seed meal can be used as a high protein, nutrient-filled animal feed. Being that current pennycress varieties are not far removed from wild strains, we are working to rapidly improve breeding-line agronomic traits such as seed dormancy, pod shatter, seed oil and meal quality, and time to maturity, by using both forward and reverse genetics approaches. This presentation will highlight our efforts in using CRISPR-Cas9 genome editing tools to rapidly improve pennycress as a profitable oilseed-producing winter cover crop, employing knowledge gained from decades of research on Arabidopsis and other Brassicaceae.

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

Presenter	Farchmin, Paige Undergraduate, Biological Sciences
Mentor	Prof. Laura Vogel
Co-Mentor	Prof. Rachel Bowden
Authorship	Paige Farchmin; Ceara Abbott; Beto Araiza; Rachel Bowden; Laura Vogel

While much is known about the human immune system, we don't know much about reptilian immune responses. Turtles have long life spans and certainly their immune system contributes to their longevity. Our lab is interested in how turtle immunity works, so we performed experiments to test how turtle white blood cells reacted in common immune assays.

First, we determined if turtle cells could be analyzed and sorted on our new cell-sorting instrument, the FACSMelody. As the instrument has different filters for different size cells, we first determined which filter to use during analysis. Our hypothesis was that the larger turtle cells would appear properly using the 2.0 filter. We analyzed cells run on 1.0, 1.5 and 2.0 filters. We did find that turtle cells were larger in size and need the 2.0 filter.

Next, we needed to determine if turtle cells would survive the cell sorting process on the instrument. We hypothesized the newer and faster sorting technology on the FACSMelody would increase cell survival. We predicted that turtle B cells would be able to survive the sorting. Turtle immune cells were run and sorted into B cell and non-B cell populations. Unfortunately, we found that non-B cells survived, while B cells died during sorting.

Next, we tested two commonly used salt solutions to see if they affected cell viability. BSS is commonly used on human and mouse cells and Ringer's solution is used for amphibians. We hypothesized that reptile cells would survive better in the Ringer's Solution. Turtle immune cells were incubated in each solution and then viability determined. We found that reptile cells did survive better in the Ringer's Solution.

Finally, we tested a method commonly used in purification of human/mouse antibodies from serum samples. Based on previous experiments from our lab, we hypothesized that the Protein G method would not be successful in purifying antibodies from turtle serum, however a recent publication from another lab suggested it may be used. We predicted that the serum proteins from red-eared sliders would not bind to a Protein G column and be washed through. Very little protein was detected after running turtle serum in the assay. Thus, as predicted, the Protein G column was not successful in purifying the antibodies from our turtle species. Overall, our experiments suggest methods commonly used in human/mouse immunology may need to be modified for turtle cells.

CONCEALED CARRY WEAPON LAWS AND THEIR EFFECTS ON HOMICIDE RATES IN THE UNITED STATES

Presenter

Fischer, Noah

Undergraduate, Politics and Government

Mentor

Prof. Meghan Leonard

For over two decades, the merits of concealed carry weapon laws have been heavily debated. Authors have taken various positions on the subject ranging from advocacy for concealed carry laws to caution against the implementation of said laws. Likewise, the authors' reasoning for their stance on concealed carry weapon laws are also varied and, at times, very oppositional. In this study, I hope to highlight several of the main arguments that divide scholars on the issue of concealed carry laws, design my own study based upon the relative strengths and weaknesses of each study, and utilize my results as well as the circumstances surrounding the issue to offer possible policy or non-policy suggestions on the issue of concealed carry weapon laws.

PREVALENT FORMS OF ECONOMIC INSECURITY IN BLOOMINGTON-NORMAL

Presenter

Fischer, Noah

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

This research project is one of a series of individual photo essays undertaken to explore current or potential human security threats at the local level. This project accompanies essays completed by other members of class to give a holistic view of the state of human security in Bloomington-Normal. This essay focuses specifically on current and potential sources of economic insecurity in Bloomington-Normal. Studies in human security are generally regarded as interdisciplinary frameworks centered on the welfare of people, rather than conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There are few studies that employ this concept at local levels within developed countries, and thus our community serves as a site of inquiry for this class project. My own collection of captioned photographs and accompanying narratives underscores the subjective nature in determining who defines security, what it constitutes and who is at risk, and demonstrates that perceptions of human (in) security can be made visible through arts-based research methodologies.

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

Presenter	Fisher, Samuel Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Samuel Fisher; Samantha Huffman; Michael Webb

Alzheimer's disease is currently an incurable neurodegenerative disorder that is characterized by the aggregation of the peptide amyloid- β ($A\beta$). Ruthenium-based compounds have been observed to modulate the aggregation of $A\beta$, thus preventing toxicity. However, further evaluation is imperative to discern what properties of the ruthenium-compounds are most significant and effective in preventing $A\beta$ toxicity. The ruthenium-compounds are most significant and effective in preventing $A\beta$ toxicity. The ruthenium complex, imidazolium [trans-tetrachloro(1H-imidazole)(S-dimethyl sulfoxide)ruthenate (III)] (NAMI-A), was evaluated for its ability to prevent $A\beta$ aggregation in vitro and displayed promising results. By modifying the ligands on the ruthenium center, derivatives of NAMI-A will be prepared to determine the impact of the ligands on $A\beta$ binding and peptide aggregation. Once synthesized, the metal-based compounds will be studied under biological conditions for their stability and effectiveness in limiting the toxicity of $A\beta$. Aggregation was monitored using a ThT fluorescence assay, from which preliminary data suggest that our NAMI-A derivatives inhibit $A\beta$ aggregation better than the trans-symmetric complexes. The implications of this study are discussed in relation to expanding alternative therapeutic strategies for Alzheimer's disease.

REFUGE-MEDIATED APPARENT COMPETITION IN A TALLGRASS PRAIRIE?

Presenter	Fowler, Jessica Graduate, Biological Sciences
Mentor	Prof. Victoria Borowicz
Authorship	Jessica Fowler; Victoria Borowicz

The refuge-mediated apparent competition hypothesis (RMACH) posits that a plant species can indirectly reduce growth of potential competitors, and thus invade, by providing refuge for herbivores of more palatable surrounding plants. *Lespedeza cuneata* is a non-native legume rapidly invading the Midwest. If *Lespedeza cuneata*'s dense and chemically defended foliage provides refuge for herbivorous arthropods, I predict (a) higher abundance of arthropods in areas where *L. cuneata* is present, indicating that it provides more suitable habitat, (b) higher percent herbivory on the plants surrounding *L. cuneata* than on *L. cuneata* itself, indicating it is not a food source and (c) reduced herbivory on neighboring plants where *L. cuneata* has been removed. Summer 2017 I tested prediction (a) in a field experiment, in Hudson, Illinois, to determine how removing *L. cuneata* would affect the abundance of arthropod species. I removed *L. cuneata*, monthly from 20, 1-m² plots and left another 20 plots unmanipulated and sampled these plots monthly for arthropods that I identified to at least order. Summer 2018 I tested predictions (b) and (c) with the same 40 plots and treatments, but this time placed phytometer species (select native species) in the plots and measured herbivory of selected leaves.

A multivariate analysis of variance performed on arthropod abundances showed the treatment had no overall effect; however, individual analyses of variances comparing treatment within taxa showed that Japanese Beetles, a particularly devastating invasive, were two times more abundant in plots with *L. cuneata*. These results support prediction (a), indicating that Japanese Beetles prefer plots with *L. cuneata*. A generalized linear mixed model performed on percent total herbivory of the selected phytometers showed no significant impact of the treatment, however, *L. cuneata* had significantly higher total herbivory than the native species. A generalized linear mixed model performed on percent herbivory of the selected phytometers showed no significant impact of the treatment. The results of the herbivory analyses do not support predictions (b) and (c); *L. cuneata* had higher herbivory than native species and there was no effect of *L. cuneata* removal on the herbivory of the native species. *L. cuneata* phytometer plants were very young when placed in the field for herbivory analysis and these immature plants may have insufficient chemical defenses to deter herbivores. *L. cuneata* and Japanese Beetles may interact in a way that facilitates the invasive plant, whether it is through refuge-mediated apparent competition or another mechanism of invasion.

EFFORTS TOWARDS THE ASYMMETRIC SYNTHESIS OF A HUMAN T-CELL LEUKEMIA VIRUS-1 PROTEASE INHIBITOR: A CHEMOSELECTIVE ZINC (II) ACETATE-TRIETHOXY SILANE REDUCTIVE PATHWAY TO THE INHIBITOR

Presenter	Garrelts, Elizabeth Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Elizabeth Garrelts; Shawn R. Hitchcock

The Human T-cell leukemia virus (HTLV-1) can cause leukemia and lymphoma in human beings and is transferred through various pathways that range from sharing syringes, blood transfusions, and from mother to child during birth.¹ This particular disease effects Japan, Melanesia, South America, the Caribbean, and sub-Saharan Africa and was likely spread through the hunting of primates that were infected with the Simian T-lymphotropic virus type 1.² In 2003, Akaji and coworkers disclosed a method for the preparation of a protease inhibitor that would be effective against HTLV-1.³ We became interested in determining if the process could be made more efficient by the asymmetric glycolate aldol addition reaction, which would already have certain functionalities present. To this end, we have developed a synthetic pathway towards the preparation of this compound. The pathway involves the application an oxazolidine-2-thione templated asymmetric glycolate aldol addition reaction, and aminolysis of the resultant glycolate side chain. The amide products generated via this process are under evaluation for their usefulness in chemoselective zinc (II) acetate-triethoxysilane based reduction to the corresponding amine substrates. Ultimately, these amine substrates transformed into the key component of the Akaji protease inhibitor by means of a unprecedented convergent process.

1. National Cancer Institute. <http://www.cancer.gov/> [Accessed Mar 23, 2016].
2. Calvignac-Spencer, S.; Adjogoua, E. Origin of Human T-Lymphotropic Virus Type 1 in Rural Côte d'Ivoire. *EID*. 2012, 5.
3. Akaji, K.; Teruya, K.; Aimoto, S. *J. Org. Chem.* 2003, 68, 4755-476.

BLACK PANTHER: NOT THE MESSIAH WE WANTED

Presenter

Gasarah, Msuur

Graduate, Theatre and Dance

Mentor

Prof. Kee-Yoon Nahm

“Everyone enjoys a good film.” This statement begins Colin McGinn’s book *The Power of Movies*. Sometimes even before we see films, we decide which ones are good and which are not. *Black Panther* is one that has been considered ‘good,’ even much more, historically significant. The film is looked upon as a ‘black’ movie celebrating the motherland, Africa, and most African Americans would defend its honour, with black allies feeling obliged to see or like the movie. However, like most works of art, not everyone feels the same way. This paper critiques the film’s representation of African identity, arguing that African stereotypes still persist.

EFFECTS OF PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION EXERCISE ON LOWER EXTREMITY BALANCE ABILITY IN A HEALTHY COLLEGE-AGE POPULATION

Presenter	Ghilardi, Tori Graduate, Kinesiology & Recreation
Mentor	Prof. Justin Stanek
Authorship	Tori Ghilardi; Justin Stanek

Effects of Proprioceptive Neuromuscular Facilitation Exercise on Lower Extremity Balance Ability in a Healthy College-Age Population Tori Ghilardi, ATC, Justin Stanek, PhD, ATC Department of Kinesiology and Recreation, Illinois State University

ABSTRACT Context: In active individuals, increased balance ability is associated with reduced risk of injury. Proprioception, the body's ability to sense joint positioning, is a key factor in balance. Proprioceptive Neuromuscular Facilitation (PNF) was developed by physical therapists in the 1940s. It consists of a variety of stretching techniques and diagonal movement patterns which are meant to increase joint proprioception and improve postural stability. Previous research has shown that lower extremity PNF movement patterns can help to improve balance ability in the elderly and post-stroke patients. However, this relationship has not been explored in young, healthy individuals. Objective: To determine if a four-week lower extremity PNF exercise program improves balance ability in healthy college students. Design: Randomized Control Trial. Setting: Athletic Training Education Program Laboratory in the School of Kinesiology and Recreation (KNR). Participants: Thirty undergraduate and graduate KNR students ages 18-30 randomly assigned into intervention (n=15) or control (n=15) group. Intervention: Four-weeks of a PNF pattern exercise program, completed two times per week. Outcome Measures: Center of pressure area and displacement during single-leg stance on a force plate, Y-Balance test scores. Results: Data collection is incomplete, but results section will display changes in force plate data and Y-balance scores between pre and post testing for the intervention and control groups. Conclusions: The conclusion section will discuss the clinical relevance of the data and whether this exercise program could be used for injury prevention and rehabilitation.

IS THERE CHAOS IN THE IRREGULAR FIRING PATTERNS DURING MODULATOR-INDUCED TRANSITIONS BETWEEN NEURONAL ACTIVITY STATES?

Presenter	Gonzalez, Josselyn Graduate, Biological Sciences
Mentor	Prof. Epaminondas Rosa
Co-Mentor	Prof. Wolfgang Stein
Authorship	Josselyn Gonzalez; Rosangela Follmann; Wolfgang Stein; Epaminondas Rosa

Transitions in neuronal rhythmic activity mediate changes in an organism's behavior and are an essential component of sensory and motor systems. Typical processes subject to changes in their dynamical states include sleep and wakefulness, seizures, and animal gait speeds, for example. When neurons transition from one well-defined rhythmic state to another, they often exhibit irregular firing patterns. Computational models indicate that this irregularity is not random, but chaotic. In mathematics, chaos describes model systems whose behavior is deterministic and exhibits exponential sensitivity to initial conditions. This sensitivity contributes to long-range unpredictability. In contrast, randomness describes a system whose unpredictability is probabilistic. Whether chaos is indeed present in transitions observed in biological systems, and how this contributes to the neuronal activities produced is not well-understood.

We aim to understand how transitions occur in biological systems by using a combined computational and biological approach. By observing neuropeptide-induced activity transitions in a small, well-characterized crustacean motor system, we seek to determine whether the observed irregular neuronal activity is chaotic or not, and to understand the role of this phenomenon in transitions between rhythmic states.

In the biological system, modulation from descending neurons is necessary for rhythmic activity. One such modulator is the peptide proctolin. Our results show that after blocking modulatory input, application of proctolin to the system increases neuronal firing rates and elicits transitions from an arrhythmic tonic firing state to a rhythmic bursting one via a depolarizing, inward modulator-induced current (IMI). Our computational approach uses an extended version of the Hodgkin-Huxley single neuron model to implement IMI. Increasing IMI increases firing rates but elicits transitions from rhythmic bursting to rhythmic tonic, in the direction opposite to what is observed in the biological system. Further, the model suggests that the duration of the chaotic window within transitions depends on factors such as cell excitability. The biological data suggests that the duration of the irregular activity depends on the concentration of the modulator added. This is consistent with the computational model as modulator concentration and cell excitability are related. Analysis to determine whether or not the experimental data is chaotic has produced promising Lyapunov exponents, which quantify how little predictability the system shows over a long period of time and thus serves as a good indicator of chaos. We are currently extending our numerical analysis of the experimental time series to further investigate the putative chaotic transition between activity states.

SAFE SPACES AND ARTISTIC RESPONSIBILITY

Presenter

Goyer, Jenny
Undergraduate, Theatre and Dance

Mentor

Prof. Ann Haugo

Theatres and other artistic venues have often been referred to as a "safe space." Based on a survey of adults between the ages of 18 and 67, of all genders, and 40% coming from non-arts-related careers, it was determined that 70% of people believed that an artistic space should be required to be a safe space. Survey participants demonstrated that a safe space meant a judgement free zone, a space of mutual respect and collaboration. This contradicts the official definition, which requires a safe space to be free of bias, conflict, criticism, or potentially threatening actions, ideas, or conversations. With this dissonance between the official definition and the public's views on safe spaces, the arts have been misbranded as a 'safe space.' The misbranding of theatre has become a toxic characteristic that promotes censorship of threatening or challenging work.

In this two-part study, public opinions on safe spaces are presented and a conversation between theatre artists on the basis of threatening work is analyzed. Jackie Sibblies Drury's play *We Are Proud to Present a Presentation About the Herero of Namibia, Formerly Known as Southwest Africa, From the German Südwestafrika, Between the Years 1884-1915* and Bruce Norris's *Downstate* are analyzed for their threatening content and challenging benefits to audiences. Although the theatre cannot be defined as a safe space because of its innate characteristic to challenge artists and audience members, it can provide a supportive and equitable environment. This branding provides the audience experiences they desire while not inhibiting work that is presented onstage. By supporting the theatre as an equitable space, artists have the opportunity to present challenging work that provokes an open dialogue.

EFFORTS TOWARD A VERSATILE INTERMEDIATE ALLOWING FOR INVESTIGATION OF OXIDOPYRYLIUM-BASED [5+2] CYCLOADDITIONS EN ROUTE TO TOXICODENANE A AND DERIVATIVES

Presenter	Grabowski, Jake
	Graduate, Chemistry
Mentor	Prof. T. Andrew Mitchell
Authorship	T. Andrew Mitchell; Jake Grabowski

Cycloaddition reactions are valuable synthetic tools, providing efficient reaction pathways toward the formation of complex three-dimensional polycyclic structures from planar precursors. Previously, the Mitchell research group has reported differing reactivity of various acetoxypyranone substrates in the investigation of oxidopyrylium-alkene based [5+2] cycloadditions.² Cycloadditions proceeding via silyloxypyrones are also efficient routes toward bridged polycyclic ethers, which are common structural motifs found in several types of biologically active compounds.³ Thus, further exploration of oxidopyrylium-based [5+2] cycloaddition pathways will lead to the synthesis of these classes of compounds. Toxicodenane A,⁴ one example of a bridged polycyclic ether, provides an opportunity to demonstrate the utility of acetoxypyranone-based [5+2] cycloadditions. Major disconnections reveal the possibility of an intramolecular oxidopyrylium [5+2] cycloaddition mediated by a silyl-allene tether as an efficient route toward toxicodenane A beginning from commercially available dimedone. While recent advancements have been made by other groups,⁵ we propose a total synthesis of toxicodenane A implementing the key oxidopyrylium-based [5+2] cycloaddition to construct the bridged-ether core.

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INTRODUCTION TO THE BENFORD LAW

Presenter

Gramm, Reid
Undergraduate, Physics

Mentors

Prof. Rainer Grobe, Prof. Q. Charles Su

Authorship

Reid Gramm; Rainer Grobe; Q. Charles Su

The quasi-empirical 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. In this presentation, a general introduction to this unusual mathematical law and its profound implications to everyday life, politics, and even in science are given. [1] This work has been supported by the NSF, NSFC and Research Corporation.

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DEVELOPING A CHIRAL AUXILIARY OXADIAZINONE PLATFORM FOR THE ASYMMETRIC SYNTHESIS OF GAMMA-AMINO ACIDS: OXADIAZINONES AS CHIRAL TEMPLATES FOR ASYMMETRIC CONJUGATE ADDITION

Presenter	Grunloh, Morgan Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Morgan M. Grunloh; Shawn R. Hitchcock

Oxadiazinones are chiral auxiliaries that have been applied in the asymmetric aldol addition reaction to synthesize valuable synthetic fragments such as the aldol side chain of the multi-drug resistance medicinal agent hapalosin. We seek to expand the catalog of reactions that the oxadiazinones can be employed in. Our current efforts are directed towards employing these compounds as chiral scaffolds for the process of asymmetric conjugate addition with the ultimate objective of using this methodology in the preparation of gamma-amino acids such as lycra. Our preliminary efforts focused on the use of an N4-p-methoxyphenyl substituted oxadiazinone as the chiral scaffold. This oxadiazinone was acylated at the N3-nitrogen with trans-cinnamic acid via the Steglich reaction with 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC) and catalytic N,N'-dimethylaminopyridine (DMAP). This substrate was then reacted with a Normant reagent, a mixture of the Grignard reagent methylmagnesium bromide and copper (I) bromide-dimethylsulfide complex. The addition reaction was carried out in diethyl ether and in tetrahydrofuran. While tetrahydrofuran gave the superior result, the diastereoselectivity of the conjugate addition was determined by 500 MHz NMR spectroscopy to be no greater than 3:1 ratio of diastereomers, a value unsuitable for meaningful asymmetric synthesis. This observation was in contrast to higher stereoselectivities observed in the asymmetric aldol reaction where ratios of 95:5 are commonly observed. It was reasoned that the electrophilic site of the conjugate addition was further away from the stereodirecting group at the N4-position than the aldol reactive site. To resolve this issue, a new system, namely the more sterically demanding N4-2-naphthylmethyloxadiazinone, was designed and prepared and used in the asymmetric conjugate addition process. This poster will describe the chemistry that has been accomplished to this point, and make projections for future efforts in the effort to synthesize the medicinally valuable target compound lycra.

DO VALUE SYSTEMS INFLUENCE FINANCIAL SPENDING?

Presenter	Hawkinson, Garrett Graduate, Psychology
Mentor	Prof. Leandra Parris
Co-Mentor	Prof. Daniel Lannin
Authorship	Garrett Hawkinson; Leandra Parris; Daniel Lannin; Ani Yazedjian

In the face of financial strain, financial literacy education has been implemented with the noble goal of improving financial knowledge and outcomes. Due to increasing rates of debt, bankruptcy, and lower savings funds these programs are in continued need of evaluation (Fox, Bartholomae & Lee 2005). Financial literacy is defined as the ability to read, analyze, and manage personal financial conditions (Zait & Berta 2014). However, research has been limited regarding the relationship between financial literacy and actual behaviors that people engage in regarding economic decisions (i.e., financial behaviors). Meta-analysis of previous studies involving these programs found that they only account for .01% of the variance in financial behaviors (Fernandes, Lynch, & Netemeyer, 2014). Additionally, state mandated personal finance courses have also shown to have no effect on savings or investment behavior (Cole & Shastry, 2010). Given these findings, it is crucial that financial literacy programs be improved to provide better outcomes and to act as a preventative measure for our youth.

Financial education should exhibit relevance to participants to engage and motivate them (Henn 2008). Research is needed on evaluating characteristics of the individual and their impact on education outcomes. Such differences individuals have included their value systems (i.e., intrinsic and extrinsic). Those with extrinsic values are motivated by outside factors, while those with intrinsic values are motivated by internal factors. Research has found that those holding extrinsic values is a predictor of negative outcomes (e.g., debt, relationships, conflicts), while those holding intrinsic values is a predictor of more positive outcomes (Kasser, 2016). Participants holding extrinsic values may be at increased risk for negative financial outcomes, and therefore should be evaluated on their response to financial literacy education.

The current study evaluated the impact of participants value systems on their financial literacy education outcomes (e.g., financial knowledge and adaptive spending behaviors). The financial literacy curriculum was implemented by the Champaign Area Relationship Education for Youth (CARE4U) program, which serves disadvantaged youth. Specific research questions were 1) How does the CARE4U program impact financial behaviors? 2) How do pretest measures of intrinsic, extrinsic, and financial literacy influence financial behaviors following program completion? Qualitative and quantitative data were gathered to address these research areas.

ELUCIDATING POTENTIAL BINDING PARTNERS OF AN ARCHAEOAL TRNA SYNTHETASE

Presenter	Hellberg, Karl Graduate, Chemistry
Mentor	Prof. Christopher Weitzel
Authorship	Karl Hellberg; Christopher S. Weitzel; Alexander Gatten

The aminoacyl-tRNA synthetases are responsible for aminoacylating, or charging, tRNAs with their cognate amino acids, a critical role in the production of proteins. Once thought to be exceedingly rare, it is now clear that synthetase paralogs resulting from gene duplication events are a persistent occurrence, particularly in the Bacteria domain. While altogether infrequent in the domain Archaea, the Sulfolobaceae family contain a conserved duplication of leucyl-tRNA synthetase (LeuRS). These paralogs are referred to as LeuRS-F and LeuRS-I. Interestingly, LeuRS-I is deficient in charging activity, while LeuRS-F displays a robust ability to aminoacylate tRNA^{Leu} with leucine. This begs the question as to why this protein has been conserved through the evolution of three genera within this archaeal family. In one effort to establish the cellular function of LeuRS-I, we focused on a reoccurring observation: the detrimental effect this protein can have on *Escherichia coli* (*E. coli*). Although deleterious, *E. coli* containing LeuRS-I still manage to subsist. We hypothesize that the toxicity is a direct consequence of this synthetase paralog binding to a target within *E. coli* that fulfills an essential function for this bacterium. Upon binding this target, we postulate that this function is inhibited leading to complications for any cell containing our *Sulfolobus* protein. In order to functionally connect this interaction to what occurs in *Sulfolobus islandicus*, we also hypothesize that 1) this target, while in *E. coli*, should also be in *Sulfolobus islandicus* and 2) while the interaction between LeuRS-I and this target is detrimental in *E. coli*, it would prove beneficial within *Sulfolobus*. Using co-immunoprecipitation (Co-IP) reactions, experiments designed to identify protein binding partners of LeuRS-I within *E. coli*, in parallel with tryptic peptide sequencing by mass spectrometry, we identified three potential *E. coli* protein binding partners of LeuRS-I: cysteine desulfurase, glyceraldehyde 3-phosphate dehydrogenase (GAPDH), and CTP Synthase. Significantly, each of these putative binding partners has a homolog within *Sulfolobus islandicus*. Additionally, each plays a significant biological role. Herein we report preliminary results testing the direct binding of LeuRS-I to each of these target proteins using metal-affinity chromatography and immunoprecipitations. Protein interactions are detected using coomassie staining of sodium dodecyl polyacrylamide gels and Western blotting.

QUANTUM FIELD VERSUS EXTERNAL FIELD APPROACHES TO THE BREIT-WHEELER PROCESS

Presenter	Hershenhouse, Tyler Undergraduate, Physics
Mentors	Prof. Rainer Grobe; Prof. Q. Charles Su
Authorship	Tyler Hershenhouse; Rainer Grobe; Q. Charles Su

In 1934, Breit and Wheeler published a famous article entitled “Collision of two light quanta”, in which they predicted the production of positron electron pairs as a result of the collision of two light quanta. In that paper [1], they argued “It is also unnecessary to use quantized light waves in the pair production problem, since the results with quantized waves are known to be identical with those obtained by means of ordinary waves.” For more than 80 years since this work, no one has challenged this statement. In this presentation we report a preliminary finding based on quantum field theory that yields results different from Breit and Wheeler’s original claim. We argue that when intensity of the incoming light fields is sufficiently strong or when interaction time is long, it is necessary to consider the quantum nature of light to accurately describe the Breit-Wheeler process. This work has been supported by the NSF, NSFC and Research Corporation.

[1] G. Breit and John A. Wheeler, Phys. Rev. 46, 1087 (1934).

OPTIMAL SUPERCRITICAL POTENTIALS FOR THE ELECTRON-POSITRON PAIR-CREATION RATE

Presenter	Hershenhouse, Tyler Undergraduate, Physics
Mentors	Prof. Rainer Grobe, Prof. Q. Charles Su
Authorship	Tyler Hershenhouse; Shansi Dong; Rainer Grobe; Q. Charles Su

We examine the steady state electron-positron pair creation rate for supercritical electric potentials with arbitrary spatial dependence. The numerical optimization algorithms predict that the set of external fields that can maximize the production rate for positrons with a given energy take non-trivial spatial shapes. We explain the underlying physical mechanisms based on a remarkably simple analytical model that exploits resonances among the negative energy eigenstates of the Dirac Hamiltonian. The results are rather encouraging from an experimental perspective as they suggest that one does not require unachievable infinitely large fields to maximize the possible pair creation yield. In fact, in many cases smaller electric fields lead surprisingly to larger yields for given energy ranges. This work [1-7] has been supported by the NSF, NSFC, Research Corporation, and the China Scholarship Council program.

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BRIDGING THE INFORMATION GAP BETWEEN FARMERS AND NON-FARMERS

Presenter

Hoerbert, Bailey
Undergraduate, Agriculture

Mentor

Prof. Maria Boerngen

American consumers have a lack of trust towards agriculture producers. With less than 2 % of the population being directly involved in farming, the general public has lost touch with where their food comes from and are becoming more concerned about the overall production of crops and livestock. This fear stems from consumers getting false information from unreliable resources. A recent report found that younger adults have more trust in technological sources such as bloggers, fitness apps, and TV personalities than in information from farmers and scientists ("2018 Food," 2018). These sources that are not directly involved in production agriculture have generated negative perceptions of GMOs and livestock production. Wunderlich and Gatto found that 70% of respondents were afraid of GMOs and afraid to eat food that contains traces of GM products because the respondents believe GMOs are dangerous; this same majority also knows very little or nothing at all about GMOs (2015). The same can be said for the livestock industry. A majority of Americans think that "factory farms" outnumber family farms, and that these "factory farms" have no sense of animal welfare or humane handling of livestock. Farmers see negative media stories about agriculture too. Even though they know the truth about what goes on in production agriculture, it can be difficult to get that message out to consumers. Because of this, producers are now in a position of needing to advocate for agriculture, and this involves doing a better job at telling their story to whoever will listen in hopes of regaining the trust of consumers. However, despite the negative views from consumers, it seems as though there may be hope for the image of the agriculture industry. Consumers see family farmers, specifically, as trustworthy sources for all food-related issues, however, they do not realize that family farms make up 97% of all the farms in America.

This study aims to address the information gap between farmers and the non-farming public. We will bring farm and non-farm students together to discuss the agriculture industry and challenges that farmers face. Through questionnaires administered prior to this experience, we will measure the non-farm students' perceptions of farming, and the farm students' beliefs about how farming is perceived. Follow-up questionnaires will evaluate how these perceptions and beliefs change as a result of this experience. Our overall goal is to contribute to a mutual understanding between farmers and non-farmers.

VOLUNTARY COMPLIANCE: ENCOURAGING BEST MANAGEMENT PRACTICES TO REDUCE NUTRIENT LOSS

Presenter	Hoselton, George Graduate, Agriculture
Mentor	Prof. Maria Boerngen

Nitrogen fertilizer runoff in the Mississippi River Basin has caused a hypoxic zone in the Gulf of Mexico. Through efforts such as the Illinois Nutrient Loss Reduction Strategy, farmers are being challenged to voluntarily make production changes to limit the amount of nitrogen they lose from their fields through runoff. If these issues are not resolved through voluntary compliance, there is a possibility that policy actions may be taken that will require farmers to change their production practices. Best Management Practices (BMPs) currently recommended to reduce nutrient loss include cover crops, different application timing, bioreactors, wetlands, and buffers. However, the adoption of new or unfamiliar farming practices such as these BMPs is inherently risky for farmers. We have conducted a thorough review of the available literature on Best Management Practices, farmers' risk perception, and risk tolerance as we study ways to encourage on-farm decision making that will voluntarily reduce nutrient loss.

With the help of nutrient loss experts at the Illinois Corn Growers Association (ICGA), we surveyed the membership of the ICGA. This survey helps us gain a more detailed understanding of how farmers view and are responding to concerns about nutrient loss, and their willingness to voluntarily comply with nutrient loss reduction goals. This group of individuals was chosen because they would be most affected by regulation limiting nitrogen timing or application. The survey was designed using the Internet, Phone, Mail, and Mixed-Mode Surveys: The Tailored Design Method handbook (Dillman, Smyth, and Christian, 2014).

Questions addressed farmers' awareness of and concern for nutrient loss issues, implementation of BMPs, and demographic characteristics. We received 762 completed surveys. The majority of respondents (90.9%) believe that nutrient loss negatively impacts the environment, and 88.1% are very or somewhat concerned about the implementation of regulation because of nutrient loss. This study will help us understand the steps farmers are already taking to voluntarily address nutrient runoff, and will contribute to encouraging more widespread adoption of Best Management Practices.

FEASIBILITY STUDY OF PEDESTRIAN BRIDGE PROJECT FOR RAILROAD CROSSING IN COLLEGE TOWN

Presenter	Hu, Xi Graduate, Technology
Mentor	Prof. Haiyan Xie

Pedestrians are frequently in dangerous situations when they have the illegal or unethical occupancy of roadways or make mistakes by competing against moving vehicles. For instance, an ongoing issue with standing freight trains periodically blocking rail crossings in Normal, a college town in the Midwest of the U.S., has created serious delays for pedestrians and motorists alike. Besides the inconvenience of delay, serious safety concerns with pedestrians disobeying train-crossing gates and travelling across the tracks between train cars burst out as well. To make exercises on the trial more efficient and decrease the potential safety hazards for students, this research takes into consideration the feasibility of a pedestrian bridge construction project, which will connect the separated trails when people walk on Constitution Trail from apartments to school, cafeterias, and for other activities, with public private partnership potentials.

To find the proper model for decision making process, the authors compared the Vroom-Yetton-Jago Decision Model (Vroom; Yetton, 1973), OODA Loop model (Byus, 2018), Recognition-Primed Decision (RPD) model (Klein, 2008), and Fuzzy Comprehensive Evaluation (Zhou; 2015). Primary data is obtained by public questionnaires, field trips and environmental impact assessment; secondary data, including cost, construction time and maintenance fee will be acquired through empirical analogies of pedestrian construction case studies.

The preliminary results include the case studies of similar projects and the creation of the evaluation system. The trends observed in the case studies indicate that information sharing and community participation are critical to the success of infrastructure projects. The common understanding of project concerns and community awareness in local business, college students and authority having jurisdictions provide financial support to the pedestrian bridge. With the technology of infrastructure information modeling and 3D printing, the authors printed the physical model after the completion of feasibility study. The primary intellectual contribution of this research is the analysis of public-private partnership as a possible funding source for the bridge project.

In this study, the authors innovatively implemented infrastructure information modeling and 3D printing which provide a clear guidance for subsequent construction. Accordingly, this feasibility study concept can be expanded to other engineering fields.

PHYSICAL EXERTION IN A NEMATODE MODEL OF DUCHENNE MUSCULAR DYSTROPHY EXACERBATES DEGENERATION

Presenter	Hughes, Kiley Graduate, Biological Sciences
Mentor	Prof. Andrés Vidal-Gadea
Authorship	Kiley Hughes; Anjelica Rodriguez; Kristen Flatt; Sneha Ray; Andrew Schuler; Brian Rodemoyer; Visalakshi Veerappan; K Cuciarone; Alex Kullman; Lim C. Lim; N. Gutta; S. Vemuri; V. Andriulis; D. Niswonger; L. Barickman; W. Stein; A. Singhvi; N.E. Schroeder; A.G. Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a genetic disorder caused by loss of the protein dystrophin, which is responsible for connecting actin fibers to the sarcolemma and transferring force laterally into the extracellular matrix. In humans, DMD presents at a young age and results in developmental delays, muscle necrosis, increased sarcoplasmic calcium, loss of ambulation, and early death. Current animal models have been challenged by their inability to model the early onset and severity of the disease without the addition of sensitizing mutations. Thus, it remains unresolved if increased sarcoplasmic calcium observed in dystrophic muscles follows or leads the mechanical insults caused by the muscle's disrupted contractile machinery. This knowledge has important applications for patients, as potential physiotherapeutic treatments may either help or exacerbate symptoms, depending on how dystrophic muscles differ from healthy ones. We observe that sarcoplasmic calcium dysregulation in *dys-1* worms precedes overt structural phenotypes and can be mitigated by silencing calmodulin expression. Recently, we showed how burrowing dystrophic (*dys-1*) *C. elegans* recapitulate many salient phenotypes of DMD including loss of mobility and muscle necrosis. Here, we report *dys-1* worms display early pathogenesis and increased lethality. To learn how dystrophic musculature responds to altered physical activity, we cultivated *dys-1* animals in environments requiring either high intensity or high frequency of muscle exertion during locomotion. We find that several muscular parameters (such as size) improve with increased activity. However, longevity in dystrophic animals was negatively associated with muscular exertion regardless of the duration of the effort. The high degree of phenotypic conservation between dystrophic worms and humans provides a unique opportunity to gain insights into the pathology of the disease as well as the initial assessment of potential treatment strategies.

THE IMPACT OF COVER CROPS AND NITROGEN APPLICATION TIMING ON SUBSURFACE WATER QUALITY

Presenter	Jefferson, Devin Undergraduate, Agriculture
Mentor	Prof. Michael Ruffatti
Authorship	Devin Jefferson; Michael Ruffatti; Rob Rhykerd; Shalamar Armstrong

"Over the past five years, the hypoxic zone in the Gulf of Mexico has had an averaged size of 5,805 square miles. This is three times larger than the 1,900 square mile target set by the Gulf Hypoxia Task Force. It is estimated that nitrate (NO₃-N) from artificially drained agricultural fields in the Upper Mississippi River Basin account for approximately 65% of nitrogen (N) entering the Gulf of Mexico, contributing to the hypoxic zone. Locally, the eutrophication of Illinois surface waters has considerable impact on drinking water quality, aquatic life, and the production of algae blooms impacting recreational ponds and lakes. The Illinois Nutrient Loss Reduction Strategy has set a goal of reducing the states nitrate-nitrogen load by 15% by 2025. There for the objective of this study where to investigate the impact of N fertilizer application timing and cover crops on the load of NO₃-N in subsurface drainage leachate. This experiment was conducted at the Illinois State University Nitrogen Management and Tile Drainage Research Site in Lexington, IL. Treatments included a zero control (no N fertilizer and no cover crop), fall dominated N application (70% fall, 30% spring) with and without cover crops, and a spring dominated N application (20% fall, 80% spring) with and without cover crops. A total rate of 225 kg N ha⁻¹ was applied to all treatments, except the zero control. Automated water samplers (ISCO 6712) were programmed to collect water samples that were analyzed for NO₃-N, ammonium, and phosphorus concentrations. Spring cover crop sampling revealed an average biomass production of 1,361 kg ha⁻¹ and an average total N uptake of 66 kg N ha⁻¹. Results following the first season of cover crop integration indicated at least a 42% reduction in tile NO₃-N leachate with the inclusion of cover crops within an N management system. With approximately 35% of Illinois crop land in tile drainage this data shows that cover crops could reduce nitrate loss significantly, working towards 2025's 15% reduction goal. "

ASSESSING ALTERNATIVE-FUEL VEHICLES FOR LOCAL GOVERNMENT OPERATION FLEET VEHICLES TO MITIGATE RISING EMISSIONS IN BLOOMINGTON-NORMAL, ILLINOIS

Presenter	Keene, Sara Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Sara Keene

National Ambient Air Quality Standards (NAAQS) have been set for six principal pollutants known as criteria pollutants by Environmental Protection Agency (EPA). These are carbon monoxide, lead, nitrogen dioxide, particulate matter, sulfur oxides, and ground-level ozone. Both the financial cost and the mandated requirements of nonattainment of these standards is significant. For example, federal funding for highway projects can be suspended, along with mandated vehicle emissions monitoring for all vehicles in the community. The Town of Normal and City of Bloomington, located in McLean County, Illinois are currently classified as an attainment area for all six categories of criteria air pollutants. However, between 2006 and 2015, the updated NAAQS standards were exceeded for Ground-Level Ozone (O₃). If Bloomington-Normal exceeds these standards again, it is possible for Bloomington-Normal to be classified as a nonattainment area. My research is focused on finding the most efficient and effective options to mitigate air pollutants. Though the greenhouse gas emissions from Bloomington-Normal Local Government Operations (LGO) buildings and facilities are much greater than the greenhouse gas emission totals of fleet vehicles, the reduction of ground-level ozone will be more significantly altered with alternative LGO fleet vehicles. Based upon the collected information, alternative options for LGO fleet vehicles were analyzed. My findings can be utilized as a case study for future emission reduction efforts in LGOs.

DO FOOD CHOICE MOTIVATIONS MEDIATE THE RELATIONSHIP BETWEEN PERSONALITY AND SUSTAINABLE FOOD CONSUMPTION?

Presenter	Kenney, Christian
	Undergraduate, Psychology
Mentor	Prof. Suejung Han
Authorship	Jordan Marshall; Suejung Han

Sustainability is a concern within Counseling Psychology (Mannarino, 2012). Sustainable food consumption (SFC) has received increased scholarly attention in the psychological literature, due to environmental challenges such as climate change, a growing human population, and a dietary emphasis on processed, convenient foods (Meyers, 2010), but their psychological predictors are not clear. SFC is defined as eating that reduces food miles, reduces meat, upholds animal welfare, uses recyclable packaging, promotes livable wages, involves organic food, and uses eco-friendly agricultural practices (Reisch, Eberle, & Lorek, 2013). This study examined Openness to Experience and Conscientiousness (John & Srivastava, 1999) as predictors of SFC and different eating-related motivations (Steptoe, Pollard, & Wardle, 1995) as indirect mechanisms. We hypothesized (a) Openness would be associated with SFC via health (i.e., motivation to eat to promote health) and familiarity (i.e., motivation to restrict to familiar foods, reverse association) and that (b) Conscientiousness would be associated with SFC via Health and Ethical Concern (i.e., motivation to eat ethically). Undergraduates (N=388) completed the Big Five Inventory (John & Srivastava, 1999), Food Choice Questionnaire (Steptoe et al., 1995), Ethically-Minded Consumer Behavior Scale (Sudbury-Riley & Kohlbacher, 2015), Local Food Purchases Scale (Birch & Memery, 2014), and an Organic Food Questionnaire (Mutlu, 2007). Path analyses using SPSS PROCESS (Hayes, 2018) supported the hypotheses partially. Openness was associated with SFC only directly ($b = 1.023, p < .001$). Conscientiousness was associated with SFC via only Health, indirect effect = .30, CI = [.06, .57]. Implications for counseling psychology will be discussed.

EFFECTS OF MARKOVIAN PITCH ANGLE SCATTERING ON NONLINEAR CHARGED PARTICLES DYNAMICS IN A MAGNETIC FIELD REVERSAL

Presenter

Kovarik, Phillip
Undergraduate, Physics

Mentor

Prof. Daniel Holland

Numerical simulation of charged particles dynamics in magnetic field reversals, such as in the Earth's magnetotail, 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 the presence of collisions, we find that the KAM surfaces in the integrable regions are destroyed and particles move throughout the region following a classical diffusion process. In particular we show that particles started in the center of the integrable region have an escape time proportional to the magnitude of the collision and inversely proportional to the square of the time between collisions. However, particles in the previously integrable region still remain trapped for long periods as compared to chaotic orbits. In addition, the boundary between the chaotic and transient regions remains, but becomes less defined. We find that the boundary spreads with a thickness proportional to the square root of the collision amplitude and inversely proportional to the time between collisions. As a function of the energy, the chaotic particle trapping time is shown to decrease for resonant energies and increase for off-resonant energies, however, the number of chaotic orbits increases for all energies. The robust nature of the phase space structures helps to explain the persistence of the distribution function signature in observed satellite data.

EVALUATION OF CRYSTAL PACKING MOTIFS OBSERVED IN STRUCTURES OF 5-METHYL-6-PHENYL-4-METHYL-1,3,4-OXADIAZINANE-2-THIONE

Presenter	Kuzelka, Kaylee Undergraduate, Chemistry
Mentor	Prof. Gregory Ferrence
Co-Mentor	Prof. Shawn Hitchcock
Authorship	Kaylee Kuzelka; Shawn Hitchcock; Gregory Ferrence

Two stereoisomers of 5-methyl-6-phenyl-4-methyl-1,3,4-oxadiazinane-2-thione have been independently prepared from (1R,2S)-ephedrine and (1S,2R)-ephedrine. Each enantiomer crystallizes as S.H hydrogen bonded dimers with two crystallographically independent molecules centered about a pseudo-2-fold axis of rotation. Crystals from a racemic mixture of these thiones also contained S.H hydrogen bonded dimers; however, the asymmetric unit contains only a single molecule, with the heteroenantiomeric dimer forming about a crystallographic inversion center. Curiously, this contrasts with the structure of the ketone congener, where the racemic crystal contains only homoenantiomeric dimers, centered about crystallographic two-fold axes of rotation. Opposing enantiomers are related through crystallographic inversion centers between (not within) dimers. This presentation will detail the synthesis and crystallography of these compounds. The crystallographic packing will be further explored using the Full Interaction Maps analysis within the Cambridge Crystallographic Database System.

APPLICATIONS OF PLATONIC SOLIDS

Presenter

Lacy, Joshua
Undergraduate, Mathematics

Mentor

Prof. Lucian Ionescu

Platonic solids have been studied and extensively researched since antiquity in an attempt to connect them with the world we live in. Kepler worked closely with these five solids to form his model for the solar system by calculating the ratios between the five planets that were known to the Ancient Greeks at the time and comparing them to the ratios belonging to the Platonic solids. Dr. Moon used these regular, convex polyhedra as a tool to model the structure of the nucleus by theorizing that the protons within an atom sit at the vertices of Platonic solids and each solid formed a different nuclear shell. The Bohr-Sommerfeld Model builds off of Kepler and Dr. Moon's work by having electrons reside within these shells, however, much like Kepler's model, it is theorized in this model that the electrons orbit the nucleus in ellipses rather than circles. Within Mathematics as well, Platonic solids and their symmetries form a sub-group within the dihedral groups. Dihedral groups are the groups of symmetry within regular polygons; however, in the third dimension, they play a key role in the symmetry of molecules and molecular orbitals forming covalent bonds. In recent years it has been attempted to use Platonic solids to model the structures of subatomic particles.

It is my attempt in this research to review the many different applications for Platonic solids throughout history and organize them in such a way that new observations may possibly be drawn.

WHAT WOULD IT TAKE FOR ECONOMIC FREEDOM TO OCCUR IN BLOOMINGTON- NORMAL?

Presenter

Lambert, Phallen

Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

This research project is one of a series of individual photo essays undertaken to explore current or potential economic human security threats at the local level. The essay focuses specifically on economic dimensions related to risks to individual well-being and dignity in Bloomington-Normal. Studies in human security are generally regarded as interdisciplinary frameworks centered on the welfare of people, rather than conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There are few studies that employ this concept at local levels within developed countries, and thus our community serves as a site of inquiry for this class project. My own collection of captioned photographs and accompanying narratives underscores the subjective nature in determining who defines security, what it constitutes and who is at risk, and demonstrates that perceptions of human (in) security can be made visible through arts-based research methodologies.

CHANGES IN FISCAL REDISTRIBUTION AND INCOME INEQUALITY (1913 - 2013): IS FISCAL REDISTRIBUTION EFFECTIVE IN CONTROLLING INCOME INEQUALITY?

Presenter

Lewis, John

Graduate, Sociology/Anthropology

Mentor

Prof. Richard Sullivan

In this study, I analyze the effects of fiscal policy on income inequality in the United States from 1913 to 2013 using an index of inequality representing the entire income distribution. This timespan covers three economic eras central to my analysis: classical liberalism (1913-1932), embedded liberalism (1933-1981), and neoliberalism (1982-2013). My research produced two major findings: First, fiscal policy reduced income inequality throughout the century. Fiscal policy reduced income inequality the least during classical liberalism and the most during neoliberalism. Despite the expansion of fiscal policy, considerable growth in inequality occurred during neoliberalism and therefore, fiscal policy was unable to keep inequality low. I conclude that fiscal policy is an unsustainable method for mitigating income inequality. Second, government expenditures reduced income inequality throughout the century. Expenditures reduced inequality the most during neoliberalism and the least during classical liberalism. Taxes reduced income inequality during the first two eras but increased income inequality during neoliberalism. This suggests that fiscal policy has transitioned from serving the interests of low income populations to serving the interests of those at the higher end of the income distribution.

QUANTUM MECHANICAL APPROACH TO THE LASER-ASSISTED VACUUM DECAY

Presenter	Lisowski, Creighton Undergraduate, Physics
Mentors	Prof. Rainer Grobe; Prof. Q. Charles Su
Authorship	Creighton Lisowski; Rainer Grobe; Q. Charles Su

The quantum field theoretical problem of the vacuum decay into electron-positron pairs induced by external force fields is mapped onto the framework of a quantum mechanical scattering process. This mapping permits us to generalize the Hund conjecture, which relates the long-time pair creation rate for a static and spatially localized electric field to the transmission coefficient, to general space-time dependent forces that can induce multi-photon transitions. 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. Using this mapping we find an analytical expression for the pair creation rate for the case where the laser's polarization direction is perpendicular to the supercritical static force field. [1-2] This work has been supported by the NSF, NSFC and Research Corporation.

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

[2] Q.Z. Lv, S. Dong, C. Lisowski, R. Pelphrey, Y.T. Li, Q. Su and R. Grobe, *Phys. Rev. A* 97, 053416 (2018).

OPTIMAL LOAD BASED ON BODY MASS: A PILOT STUDY WITH THE HANG POWER CLEAN

Presenter	Lopes dos Santos, Marcel Graduate, Kinesiology & Recreation
Mentor	Prof. Kristen Lagally
Co-Mentor	Prof. Adam Jagodinsky
Authorship	Marcel Lopes dos Santos; Ricardo Berton; Adam Jagodinsky; Michael Torry; Kristen Lagally

INTRODUCTION: A key factor for success in sports is the athletes' capacity of producing mechanical power output. Implementation of weightlifting derivatives such as the hang power clean (HPC) in training programs have been utilized and substantial increases in muscle power are reached when the athletes train at the load in which they produce the peak power output, also defined as the optimal load. The optimal load is commonly determined as a relative percentage of the maximum weight one can lift a single time during a specific exercise, defined as the 1-repetition maximum (1RM) for that exercise. Given the disadvantages of 1RM tests utilization such as risk of injuries and excessive amount of time required for those assessments, it has become apparent the need for alternative strategies for the optimal load identification. **PURPOSE:** To estimate the optimal load of the HPC from body mass (BM) percentages. **METHODS:** Nine healthy young men (age: 21.3 ± 1.8 , height: 174.6 ± 6.8 cm, weight: 80.6 ± 6.2 kg, 1RM HPC: 90.8 ± 9.6 kg, 1RM to weight ratio: 1.13 ± 0.07) participated in this study. Subjects performed a 1RM in the HPC in the first session and during the second session the peak power was calculated across loads of 30, 40, 50, 60, 70, 80, and 90% of their BM in the HPC in a randomized order. **RESULTS:** Our results showed significant differences among the power output and the percentages of the BM. Briefly, power output at 30% of the BM was similar to 40% and 50% of the BM, whilst significantly lower than 60%, 70%, 80% and 90% of the BM. For 40% of the BM, it was observed a similar result in relation to 50% of the BM, whilst results were significantly lower than 60%, 70%, 80% and 90% of the BM. For 50% of the BM, it was observed similar result when compared to 60% of the BM, with a lower power output when compared to 70%, 80% and 90% of the BM. For 60% of the BM, a lower power output was observed when compared to 70%, 80% and 90% of the BM. Finally, no significant differences were observed between 70% and 80% and 90% of the BM, as well as 80% and 90% of the BM. **CONCLUSION:** Our results indicate that the optimal load based on BM for the HPC exercise occurs at 70%, 80% and 90% of the BM.

HELPING DOG PAWRENTS HELP DOGS BECOME BETTER DOGS

Presenter	Lozano-Ziebart, Sarah Graduate, Psychology
Mentor	Prof. Valeri Farmer-Dougan
Authorship	Valeri Farmer-Dougan; Sarah Lozano-Ziebart; Jennifer Gavin; Jasmine Mason

The ISU Canine Laboratory collaboration with Pet Central Helps Animal Rescue provides a unique opportunity for students, shelter personnel and adopters to work together. This collaboration has three major goals, which provide: 1. A university teaching laboratory where students apply learning theory; 2. Consultation, training, and behavior intervention for shelter dogs; and 3. A unique environment for applied research. Students work with shelter dogs, helping them develop appropriate social skills, which allow them to be successfully adopted. Students also interact and assist adoptive and foster parents. Results of this collaboration go beyond the three basic goals, eliciting changes in attitude and empathy in the students. Initial data from surveys of participating students show that they rate pro-authoritarianism statements significantly lower, pro-benevolence statements significantly higher, and pro-social restrictiveness statements significantly lower than students enrolled in other sections of the course. Further, dog lab students viewed dogs such as pit bulls as more trainable, more likely to be an appropriate family pet, and less aggressive than students in the other course sections. It appears that working with shelter dogs may elicit changes in social attitudes and reduce restrictive judgements about particular dog breeds.

CORRUPTION DISPARITY ACROSS COUNTRIES: DOES RELIGIOSITY MATTER?

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

Why are some countries more corrupt than others and why do statistics from measures of corruption suggest that the most corrupt countries are developing countries? For instance, four out of the bottom six countries in the 2017 Corruption Perception Index ranking had a combined per capita GDP (in purchasing power parity) of \$10,977.814, against a world average of \$15,718.233. These countries may struggle with brain drain, inefficient allocation of resources, income disparity, low levels of literacy, and lack of trust in government and its agencies. Most studies on the determinants of corruption have focused on economic factors affecting corruption such as income, economic freedom, globalization, and education. However, corruption does not stem entirely from economic factors; it can be affected by cultural factors (e.g., family and gender roles, religious beliefs), which can subsequently shape individual behaviors and attitudes. Because culture may vary across countries, the focus of this paper is on cross-country differences of corruption for a cultural factor that has not received much attention within the literature: religiosity. Unlike religion, religiosity--the practice of religious beliefs and the degree of engaging in religious activities--goes beyond asking if one identifies with a particular religion to identifying the intensity of practicing the professed religion. Religion is a way of life and for religious people, their religion serves as a reference point for moral and ethical foundations. As such, religiosity makes adherents imbibe certain attitudes and behaviors, which in turn may affect their tolerance for, and likelihood of engaging in corrupt behaviors. For example, since most religions teach mercy and forgiveness, it may be the case that religious people are more lenient, tend to show mercy, and therefore may condone some level of corrupt behaviors relative to less religious individuals. It is also possible that, since most religions warn members to shun corrupt behaviors, religious people have low to zero chances of engaging in, or condoning corruption. To explore the religiosity-corruption nexus, I use panel data from World Values Survey, Transparency International, and the World Bank. Because these data only measure perception of corruption, as opposed to actual corruption for which data is almost non-existent, I employ two measures, namely the Corruption Perception Index (CPI) from Transparency International, and control of corruption from Worldwide Governance Indicators, in order to control for potential perception bias and error.

NEGATIVE EFFECTS OF HEATWAVES ON BUMBLE BEE IMMUNITY AND PARASITE RESISTANCE

Presenter	Martinez, Abraham Undergraduate, Biological Sciences
Mentor	Prof. Ben Sadd
Authorship	Kerrigan Tobin; Abraham Martinez; Ben Sadd

Ongoing climate change, including more frequent temperature extremes such as heatwaves, has direct consequences for organisms by imposing thermal stress. Changes in thermal environments can also influence health by altering interactions with other species, including parasites and pathogens. These effects may have consequences for the population viability of species of conservation concern. Indeed, climate change has been predicted to have negative consequences for many threatened pollinators. Using the bumble bee *Bombus impatiens*, a key pollinator, we test the hypothesis that thermal stress from heatwaves will be detrimental to immunity and parasite resistance. Adult bees were exposed to either control or heatwave thermal regimes, modeled on real temperature data from central Illinois. Total phenoloxidase, an enzyme involved in the melanization response of insect immunity, and induced humoral antibacterial activity were measured, in addition to total protein. Parasite resistance against the trypanosome *Crithidia bombi* was also assessed, with experimental infections taking place either before or after heatwave treatments. There was no significant effect of heatwave treatment on phenoloxidase activity or total protein. However, antibacterial activity was reduced in heatwave exposed bees. Infection intensities did not differ between heatwave treatments when bees were exposed to the parasite prior to the heatwave, but, in line with the reduction in antibacterial immunity, bees were more susceptible to infection following heatwave exposure. These results suggest that manifestations of ongoing climate change in the form of heatwaves will have a detrimental influence on the ability of bumble bees to fight infection, and consequently on their population health.

MULTIPLICATIVE STEREOTYPE THREAT: AFRICAN AMERICAN WOMEN'S MATH PERFORMANCE

Presenter	Marvin, Lydia Graduate, Psychology
Mentor	Prof. Eros DeSouza
Authorship	Lydia Marvin; Eros DeSouza

Women and racial minority groups are underrepresented in STEM according to a 2016 report from the National Science Foundation. One theory for this discrepancy is the stereotype threat phenomenon, where individuals experience anxiety in testing situations about confirming a negative stereotype about their group which in turn impedes performance. This phenomenon has a large body of published findings with two key issues. The first is that those who are targets of both racial and gender-based stereotypes are almost never studied, which continues the erroneous tradition of treating these two issues as if there is no overlap. The second is widely-varying effect sizes, with some scholars (e.g., Flore, 2018) suggesting that stereotype threat effects are exaggerated through publication bias. The proposed study addresses both issues. The four conditions (no threat, gender threat, ethnic threat, and both threats) will be entered into a custom general linear model that includes two-way interactions with hypothetical moderators (including racial identification and gender identification). I hypothesize that those who experience both gender- and ethnic-based stereotype threat will have the lowest scores, and those in the no-threat condition will have the highest scores.

INVESTIGATION DIRECTED TOWARDS THE SYNTHESIS OF PHENALIPORPHYRIN

Presenter	Mathius, Melissa Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	Melissa Mathius; Timothy Lash

Carbaporphyrins and related systems are porphyrin analogues where at least one of the inner nitrogens have been replaced with carbons. These macrocycles may have global aromaticity but in some cases the structures are nonaromatic or even antiaromatic. Benziporphyrins **1** are nonaromatic porphyrinoids due to the 6π electron arene unit introducing cross-conjugation. In this work, a benziporphyrin-like system **2** incorporating a phenalene subunit has been targeted for investigation. It is anticipated that this porphyrinoid will take on fully aromatic characteristics while retaining a fused naphthalene moiety. The required precursors to **2** are tripyrrane **3** and dialdehydes **4** or **5**. Initial attempts to prepare **4** by reacting perinaphthenone with (methoxymethyl)triphenylphosphonium chloride in a Wittig condensation, and then carrying out a Vilsmeier formylation, were unsuccessful. Currently, an alternative synthetic route to **5** is being developed starting with 1-tetralone. It is anticipated that cyclization of naphthalene intermediate **6** will afford a keto acid that can be converted into **5**. Subsequent '3+1' condensation with tripyrrane **3** will afford phenaliporphyrin.

HOOK-UP CULTURE, RAPE MYTHS, AND THE DARK TRIAD

Presenter	McAdams, Samantha Graduate, Criminal Justice Sciences
Mentor	Prof. Jeffrey Walsh
Co-mentor	Prof. Jessie Krienert

Hook-up Culture, Rape Myths, and the Dark Triad Hookup culture is a relatively new culture that endorses casual and commitment-free sexual encounters. This culture is generally recognized by adolescents and young adults and is facilitated through hookup apps such as Tinder, OkCupid, Grindr and others. The impact of hookup culture on both perception and participation in sexual violence requires empirical investigation. Sexual violence is not a new phenomenon, but has risen to the forefront of public discourse in the era of #metoo, making sexual violence a prevalent topic in popular media. Some research has linked hookup culture to perpetuating rape myths that justify sexual assault victimization. The Illinois Rape Myth Acceptance Scale measures respondents' beliefs in these rape myths. This project seeks to examine and promote greater understanding of the hookup culture at the Illinois State University, and the relationship between hookup culture and the perpetuation of rape myths. Data will be collected using a self-report esurvey sent to all students opting to participate in campus based research. The esurvey will include demographics, the Illinois Rape Myth Acceptance Scale, several hook-up questions and measures, and the Dark Triad Personality Scale. The Dark Triad Scale brings this research full circle. In addition to the relationship between hookup culture and rape myth acceptance, we will include measures of the dark triad personality traits: narcissism, Machiavellianism, and psychopathy, to better understand how these factors link to hookups and rape myth acceptance. The implications of this completed project may impact student safety and awareness and lend to sexual violence prevention, and improved self-protection.

COMPARISON OF WAIST-TO-HEIGHT RATIO AND BODY FAT PERCENTAGE FROM THE BOD POD

Presenter	McElroy, Marin
Mentor	Undergraduate, Kinesiology & Recreation
Authorship	Prof. David Thomas
	Marin McElroy; David Q. Thomas

Waist-to-height-ratio is being used as a measure to indicate a person's risk level for obesity-related health issues including cardiovascular and metabolic disease. It is a measure of a person's waist circumference divided by their height. Comparing this measure to one that is well established, percent fat taken via air displacement plethysmography (ADP), is a sure way to test the validity of this relatively new measure. It is important to understand the validity of this measure, because it could potentially be a fast and low-cost alternative to finding out one's overall risk for obesity-related diseases. **Purpose:** To determine the relationship of the waist-to-height ratio when compared to body fat percentage measured with the BodPod. **Methods:** Twenty-two volunteers (14 female subjects and 8 males) were recruited and brought in for measurement. Height and weight were taken on each subject, along with waist and hip circumferences. ADP was used via the BodPod to measure body fat percentage. Once the numbers were collected, waist-to-height-ratio was calculated by dividing out the subject's waist circumference by their height. The WTHR data was analyzed and compared to the results of body fat percentage from the BodPod for each subject. **Results:** The average age of research participants was 20.8 years (+ 1.04). The mean height of participants was 170 cm (+ 0.11), while the average mass was 69 kg (+14.37). The mean waist circumferences was 76.2 cm (+8.07). The average weight to height ratio was 44.79 (+4.21) and the average percent fat from the BodPod was 22.3 (+8.86). A correlation of $r = 0.38$ between percent body fat measured in the body bod, to waist-to-height ratio was found. **Conclusion:** The results indicate that there is a weak positive correlation between waist-to-height ratio and percent fat measured in the BodPod. Therefore, waist-to-height ratio may not be an accurate indicator of percent fat.

IMPACT OR IMPASSE: HOW TO MEASURE COMMUNITY IMPACT

Presenter

McReynolds, Joel
Graduate, Politics and Government

Mentor

Prof. Michaelene Cox

ISU's Center for Community Engagement and Service Learning requested an instrument be designed to help measure the effect of student engagement on community organizations. Using the Five-Step Applied Research process, the study reviews methods of measuring community impact and recommends an original research instrument to best meet the center's expressed objectives. The poster outlines the process of engaging in applied research in the context of a client-analyst relationship and what the next steps are for the study.

THOSE WHO WORK THE LONGEST HOURS EARN THE LEAST

Presenter

Mendoza, German
Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

This research project is one of a series of individual photo essays undertaken to explore current human security threats at the local level. The essay focuses specifically on economic dimensions related to risks to individual well-being and dignity in Bloomington-Normal. Studies in human security are generally regarded as interdisciplinary frameworks centered on the welfare of people, rather than conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There are few studies that employ this concept at local levels within developed countries, and thus our community serves as a site of inquiry for this class project. My own collection of captioned photographs and accompanying narratives underscores the subjective nature in determining who defines security, what it constitutes and who is at risk, and demonstrates that perceptions of human (in) security can be made visible through arts-based research methodologies.

SYNTHESIS OF NOVEL RUTHENIUM ANTICANCER COMPLEXES CONTAINING SCHIFF BASE LIGANDS

Presenter	Mensah, Stephen Graduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Stephen Mensah; Michael Webb

Platinum-based drugs have over the years been administered in the treatment of tumours. Unfortunately, platinum resistance and the severe side effects associated with the treatments has necessitated the research for new anti-cancer drugs. Both ruthenium(II) and (III) complexes have shown promise as useful alternative anticancer agents. Two Ru(III) complexes NAMI-A (imidazolium trans- [tetrachlorido(dimethyl sulfoxide)(1H-imidazole)ruthenate-(III)]) inhibits metastasis in lung cancer, whereas KP1019 (indazolium trans-[tetrachloridobis(1H-indazole)ruthenate(III)]) and its analogue KP1339 (sodium trans-[tetrachloridobis(1H- indazole)ruthenate(III)]) have shown potent cytotoxic activity in a number of primary human tumor models. Unfortunately, clinical evaluations of NAMI-A and KP1019 are currently unable to proceed to stage III of clinical trials, leaving KP1339 and the ruthenium (II) complex, TLD1433 as the only Ru compounds still undergoing clinical evaluation. The need for novel cancer therapeutics is therefore, necessary to produce new compounds that are relatively easier to synthesize and can readily be modified. This work focuses on the use of 2-acetylpyridine and 2-pyridinecarboxaldehyde for the synthesis, characterization, and preliminary evaluation of two different classes of ruthenium anticancer complexes containing Schiff base ligands. Here the results of the synthesis of these compounds and their subsequent characterization using standard analytical methods will be discussed.

THE ACCULTURATION GAP, PARENTAL CRITICISM, AND DISORDERED EATING AMONG LATINO/A COLLEGE STUDENTS

Presenter	Miranda, Carolina Undergraduate, Psychology
Mentor	Prof. Suejung Han
Authorship	Carolina Miranda

Acculturation refers to the process of acquiring values, belief systems, and behaviors of a new culture (Berry, 1997). In immigrant families like Latino/as, children acculturate more and faster than parents, resulting in potential intergenerational conflict due to acculturation gap (Telzer, 2010). Acculturation gap has been associated with decreased psychological functioning among Latino/as (e.g., partaking in risky behaviors, Chun & Mobley, 2014). Acculturation gap may also be associated with their disordered eating, because less acculturated Latino/a parents may make explicit negative comments on their children's body shapes (Keel, 2017), whereas more acculturated Latino/a children may find them offensive and stressful. In fact, research shows that more acculturated Latino/as show elevated rates of disordered eating (Alegria, 2007), but culture-specific etiologies have not been clarified. This study hypothesized that acculturation gap would be associated with disordered eating via perceived body criticisms by parents and lower body satisfaction among Latino/as.

Participants will be recruited via social media postings and flyers in a predominantly Latino/a local community the first author has connections with. Participants will complete an online survey of the study that includes the Acculturation, Habits, and Interests Multicultural scale for Adolescents (AHIMSA) (Unger et al, 2002), the three-factor eating questionnaire which includes cognitive restraint, emotional eating, and binge eating (Keranen, Strengell, Savolainen, & Laitinen, 2010), body dissatisfaction questionnaire (Berscheid, Walster, & Bohrnstedt, 1973), and a parental comment scale that was created for this study. The IRB proposal is under review, and the full results will be presented at the conference.

DIELECTRIC NANO-PHOTONICS-II: CAN DIELECTRIC NANOPHOTONICS SERVE AS AN ALTERNATE TO NANOPLASMONICS?

Presenter

Missel, Andrew
Undergraduate, Physics

Mentor

Prof. Uttam Manna

Authorship

Andrew Missel; Michal Szczerba; Daniel Eggena; Brighton Coe;
Uttam Manna

Nano-optics is usually associated with plasmonic structures made of noble metals to enhance the electromagnetic field on the nanoscale. However, the high level of Joule losses associated with the noble metals has always been a challenge limiting the efficiency of optical devices. In this talk, I will discuss can resonant optical excitation of high index dielectric nanoparticles offer alternate opportunities by reducing dissipative losses and large resonant enhancement of both electric and magnetic near-fields.

ANALOG IMPLEMENTATION OF THE HODGKIN-HUXLEY MODEL NEURON

Presenter	Mobile, Zach Undergraduate, Physics
Mentor	Prof. George Rutherford
Authorship	Zach Mobile; Rosangela Follmann; Epaminondas Rosa; George Rutherford

Neurons, the cells in the brain which are thought to handle information processing, are extremely complicated objects. There has been much progress in the realm of both analyzing neurons physiologically, but also modeling them mathematically. In this study, we focus on the classical model introduced by Alan Hodgkin and Andrew Huxley in 1952. By performing both computer simulations of their model and constructing an electronic circuit that behaves analogously to the Hodgkin-Huxley neuron, we are working toward an understanding of neurons on two fronts. The implementation of the mathematical model is well-suited for comprehending the cells from a dynamical systems perspective, often leading to qualitative insights in regard to the wide array of possible behaviors demonstrated by biological neurons. The electronic neuron is a physical realization of the Hodgkin-Huxley dynamics in the form of a circuit. We provide some theoretical background to the Hodgkin-Huxley model, discuss the design of the electronic neuron, and compare data from the associated circuit with data obtained from numerical simulations.

CONSTRUCTIVE DECAY RATES OF THE STANDARD MODEL II

Presenter

Moore, Annie

Undergraduate, Physics

Mentor

Prof. Neil Christensen

Authorship

Annie Moore; Neil Christensen; Santiago Pinto

We develop new tools for calculating decay rates using the recently discovered constructive techniques. We apply these to the 3-point vertices of the constructive Standard Model.

ELECTORAL VIOLENCE AND SECURITY OF RELIGIOUS MINORITY IN BANGLADESH

Presenter

Mosharref, Rashed
Graduate, Politics and Government

Mentor

Prof. Michaelene Cox

Bangladesh joined in the league of democracy in the 1990s, in what Samuel P. Huntington called the "third wave of democracy," but its institutionalization of democracy has been very slow in many aspects. Electoral violence and peaceful transfer of power is one example. Bangladesh has a history of electoral violence after every major national and local government election. Religious minorities are subject to violence after every major election. Specifically, religious minorities are targeted as they are more vulnerable to political aggression than others. It creates a sense of fear among the religious minority which is less addressed but is one of the critical issues to ensuring human security by exercise of one's democratic right to vote. From the United Nations human security perspective we are going to analyze the situation from the political and community security contexts. Our research question in this study is, how can we address security of the religious minority in the context of electoral violence? Here our focus will be to identify measures that can prevent violence and ensure human security for the religious minority in the election process.

INSECURITY (FEAR) AND IMMIGRATION POLITICS IN THE US

Presenter	Mullins, Nick Graduate, Politics and Government
Mentor	Prof. Michaelene Cox
Authorship	Nick Mullins

There is much contention in US immigration politics. Practically the centerpiece during the 2016 US presidential elections for now-President Donald Trump, the issue of migration seems to increasingly receive the treatment of a national security matter, especially after the events of 9/11. These concerns may muffle attention paid to the human security dimensions of migration, notwithstanding existential drivers in the transnational movement of people. The early Trump Administration issued three executive orders on immigration with national security concerns central, including on border security, interior immigration policy enforcement and refugee admittance reductions, and the travel ban for several Muslim-majority countries. After contextualizing the human security dimensions of migration, in addition to a background of Trump executive orders on US immigration policy, a literature review captures two prominent schools on the question of how realist national security considerations are interacting with US immigration policy. The classical realist assumptions surrounding fear and survival of the state amid an anarchic international system of states are joined by the Copenhagen School of securitization in a theoretical application that identifies a discursive process of threat construction between power-wielding actors and a receptive audience. This framework sets up for future case analyses, comparative, qualitative, and quantitative studies on the immigration-security nexus.

SUPPORT ON ABORTION FOR MINORITY WOMEN AND WHITE WOMEN

Presenter

Nemec, Victoria
Undergraduate, Politics and Government

Mentor

Prof. Carl Palmer

The main purpose of the research study was to investigate the possible bias of minority women or women of color receiving less support than white women when it comes to having an abortion. With there being other research on bias attitudes regarding women of color, there hasn't been much research and known evidence of abortion not being accepted towards minority women over white women. This raised the question of whether white women are more accepted when it comes to getting an abortion than minority woman.

To see if the hypothesis was correct, I conducted my own research using Amazon Mechanical Turk. Each participant was paid 25 cents and answered questions asking their age, gender, race/ethnicity, level of education, partisanship, religion, if they know someone who had an abortion, if they believe if abortion was morally wrong or morally acceptable and then the last question was asked through a vignette. The vignette stated a name either Jasmine, Lindsay or Destiny and said, "is 22 and became pregnant on accident. She is not able to financially support the baby when it is born. She is planning on having an abortion since she can't properly care for the baby. Do you support her decision on having an abortion?" The names were used to try to identify each woman from either the Latino, Black or White community. Using different names and the same story was to see if there was a bias towards a minority woman with a name that might indicate they're from these communities over a white woman. Each of the names through the vignette were randomly were assigned to the participant as part of the experiment.

The results of the experiment were surprising and did not support my hypothesis. After I gathered my data and ran my regressions, I found that it was the opposite of what I expected. More people supported a specific minority group (Latino/Hispanic community) more than the white woman through the vignette. Most of my participants identified as white, Christian or non-religious, and under 30 years old, I believe my findings were swayed in way because I didn't pull a diverse group of race/ethnicity, religion and more of a variety of age. Most of my variables like age and gender gave me findings that I expected. For example, more males are against abortion and older you are the less likely you are to support abortion.

PHENOTYPIC CHARACTERIZATION OF LEUCYL-TRNA SYNTHETASE GENE DUPLICATIONS IN THE ARCHAEON SULFOLOBUS ISLANDICUS

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

Aminoacyl-tRNA synthetases (aaRSs) lie at the core of protein biosynthesis-this family of enzymes catalyzes the attachment of a cognate amino acid to their respective tRNA, a process referred to as aminoacylation. The faithful execution of this activity is crucial to the proper translation of mRNA into proteins, thus being essential to the accurate decoding of the genetic code. Leucyl-tRNA synthetase (LeuRS) is a member of the aaRS family of enzymes. Interestingly, within the genome of the thermoacidphilic Crenarchaeon *Sulfolobus islandicus* (*S. islandicus*), there are coding sequences for two homologs of this enzyme, designated *leuRS-F* and *leuRS-I*. Current results suggest that *LeuRS-F*'s function is to fulfill a canonical role in protein translation. Curiously, *LeuRS-I* has not been shown to 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 knockout strain was constructed in order to observe the effect of a *leuRS-I* deletion on *S. islandicus* physiology. The deletion led to an observable delay in lag phase growth in comparison to an isogenic wild-type strain, particularly at low temperatures. Here we present data on complementation assays utilizing an *Escherichia coli* - *S. islandicus* shuttle vector harboring the *leuRS-I* coding sequence. In addition, we report the preliminary characterization of gene expression between *leuRS-F* and *leuRS-I* at multiple points along the *S. islandicus* growth curve.

GEOMORPHOLOGY OF MATTHIESSEN AND STARVED ROCK STATE PARKS

Presenter

Ohls, Kristen

Undergraduate, Geography, Geology, and the Environment

Mentor

Prof. Lisa Tranel

Starved Rock and Matthiessen State Parks in La Salle County, Illinois contain interesting canyons. They were created when glaciers formed and retreated after the last glaciation period, causing stream channels that eroded away much of the sandstone to create the canyons we know and see today. The sandstone member that makes up most of the state parks is known as the St. Peter sandstone, which is very weakly cemented and friable. Landslides are not a frequent occurrence, but happen periodically, sometimes after freeze-thaw events. This is believed to be due to the stability and steepness of the canyon walls and may be created by case-hardening of the rock surfaces due to filling bedrock pore spaces with cement. In this area, the strengthened rock surfaces could also be due to lichen and algae growth, known as lithobionts, on the surface. This sandstone also typically does not react with HCl, but it has been known observed in isolated locations. I hypothesize that this may be due to case hardening or lithobiont occurrences. My research study will investigate these bedrock features and their influence on the geomorphology of the watersheds in Matthiessen and Starved Rock State Parks. My goal is to study why there is variability of bedrock surface characteristics across the canyons in the same sandstone formation. I hypothesize that the reactions to HCl on the rock of the rock were are caused either by surface runoff or case hardening. I will test my hypothesis by observing areas every 5-10 feet at eye level, roughly 5 feet above the ground surface, and mapping which areas reacted to HCl and what biologic or water flow processes could cause the reaction. I will note proximities to the streams, and the rim of the canyon, to see if water flow containing calcite or iron drained down the canyon walls. Observations are likely to indicate different levels of erosion and stability along the canyon walls.

INDUSTRIAL HYGIENE IN THE MEDICAL MARIJUANA INDUSTRY

Presenter

Ohls, Kristen
Undergraduate, Health Sciences

Mentor

Prof. Thomas Fuller

The medical and recreational marijuana industry in the United States is valued at approximately \$8.5 billion. Medical marijuana is legal in 33 states. In ten of those 33 states, recreational marijuana is legal. Despite the recent growth, and potential future growth of the marijuana industry, little has been published about occupational risks associated with marijuana production and processing. Initial research in this study included review of all available health and safety literature to identify potential occupational exposures that could benefit from additional research. One of the topics identified was the use of hazardous chemicals for the control of pests, fungus, and mold within production facilities. Within Illinois there are approximately 12 marijuana cultivation facilities. Surveys were conducted with these 12 facilities to identify which pesticides and fungicides were being used, and what types of safety controls are in place to minimize worker exposures. Results indicated a broad range of chemicals being used in different applications. Safety controls ranging from control of application processes, use of Personal Protective Equipment, and administrative controls were also diverse between facilities. Basic observations are provided in addition to recommendations for future improvements for the industry.

SMALL MOLECULE ION CHELATORS FOR PARKINSON'S DISEASE THERAPY

Presenter	Oskard, Selena Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Selena Oskard; Michael Webb

Parkinson's disease (PD) is a common neurodegenerative disorder affecting nearly 1 million Americans. Currently, therapeutic options for PD merely treat the symptoms of the disease, while the underlying cause is not actively targeted. One of the hallmarks of PD are protein deposits comprised primarily of the protein α -synuclein (α -syn). The combination of the α -syn and the redox-active metals, copper and iron, accelerate the formation of the aggregates known as Lewy bodies and promote a toxic environment. The prevalence of iron within these Lewy bodies is a promising target for chelation, as the removal of the metal ions from α -syn should promote the disruption of the problematic protein deposits. We are currently preparing several new small molecule metal ion chelators using the copper-catalyzed cycloaddition reaction between an azide and an alkyne forming a 1,2,3-triazole. Once synthesized, the compounds are characterized by Nuclear Magnetic Resonance and Mass Spectrometry. We further analyze the compounds affinity for metals by UV-Visible Spectroscopy. Following this, analysis will be done to test the ability of the 1,2,3-triazoles to disrupt or prevent α -syn aggregation. Ultimately, these chelators would be the basis of a therapeutic strategy designed to directly target the key marker of neural degeneration in Parkinson's Disease.

GENDERED SPEECH IN OLD ENGLISH FEMALE SAINTS' LIVES: A LINGUISTIC EXAMINATION

Presenter

Parker, Alexa

Undergraduate, Sociology/Anthropology

Mentor

Prof. James Stanlaw

In medieval English literature, this acute male perspective often lead to a lack of females being represented in the writings. Yet, there is one place where females are consistently represented in writing: female saints' lives. Additionally, the female saints' lives offered stories of women acting on equal footing with men, sometimes even surpassing them in power. These religious pieces, then, are extremely interesting to investigate in terms of language use. In my research, I seek to discover if the powerful nature of these religious women represented in their represented speech? How does the female saint's speech compare to the men's speech in the literature? Is there a consistent representation of female saint's speech represented throughout these different pieces of literature, and what does that say about how women might have actually spoken? And, finally, how could the fact that these religious pieces were written by educated religious males affect the conclusions that are drawn from this research? I answered these questions by examining a collection of saints' lives written by Ælfric of Eynsham, an anonymous author, and Cynewulf. For this study, I chose three texts that represent each of these authors. The first was Ælfric's "Life of Saint Cecilia," the second was Cynewulf's "Juliana," and finally, "Life of Saint Euphrosyne" which was written by an anonymous author but is included in Ælfric's Lives of Saints. These texts provided a sound basis for investigation into how religious women's speech was represented.

A SIMPLE MODEL AS A TESTBED FOR FUNDAMENTAL NEURONAL PROPERTIES

Presenter	Patterson, Jennifer Undergraduate, Physics
Mentor	Prof. Epaminondas Rosa
Authorship	Jennifer Patterson; Rosangela Follmann; Epaminondas Rosa

Sometimes a simple mathematical model suffices for both testing and demonstrating fundamental dynamical properties of complex systems. One such example is the logistic map, a one-dimensional iterative process capable of exhibiting very complicated behaviors, including the well-known period doubling cascade in transitions between periodic behavior and chaos. Here we extend this idea to the case of neurological processes, where complex neuronal model equations exhibit intriguingly complicated transitions. These transitions have been observed both in the single neuron and in networks of neurons where fundamental features of the single neuron is passed on to the collective of the network. The question then arises on whether these are properties associated only with the complex and more complete models, or are they also present, albeit perhaps hidden in the dynamics of simpler systems. We test the idea downgrading from the Huber-Brown model (a set of four differential equations embodied with elaborated functions for specific ion channels) to the Fitz-Nagumo equations (a set of three much simpler equations). This model is based off of the Bonhoeffer-van der Pol model where, in addition to three parameters, one variable is the membrane potential, another is a recovery variable, and a third is the magnitude of a stimulus current. This is in sharp contrast to the Huber-Brown model which contains 23 parameters in addition to four time-dependent variables. In this presentation we also provide some information about typical features of the FitzHugh-Nagumo model, including its “all-or-none” response associated with the existence of no threshold for firing and absence of the saddle equilibrium. We will also discuss briefly the electronic circuit implementation of the model, done originally by J.-I. Nagumo.

APPLYING DEEP LEARNING FOR IMAGE PROCESSING USING PYTHON AND RASPBERRY PI

Presenter	Paygude, Apoorva Graduate, Information Technology
Mentor	Prof. Elahe Javadi
Authorship	Apoorva Paygude; Elahe Javadi

The purpose of this symposium is to use Python deep learning libraries (e.g., Keras and Tensorflow) in order to categorize images taken by a camera connected to a Raspberry Pi board. The study involves learning to work with Python deep learning libraries, experimenting with different settings of a deep learner network (e.g., activation functions), and working with a Raspberry Pi board for taking images.

COMPUTATION OF DIVERGING SUMS BASED ON A FINITE NUMBER OF TERMS

Presenter	Pelphrey, Richard Undergraduate, Physics
Mentors	Prof. Rainer Grobe; Prof. Q. Charles Su
Authorship	Richard Pelphrey; Rainer Grobe; Q. Charles Su

We propose a numerical method that permits us to compute the sum of a diverging series from only the first N terms by generalizing the traditional Borel technique. The method is rather robust and can be used to recover the ground state energy from the diverging perturbation theory for quantum field theoretical systems that are spatially constrained. Surprisingly, even the corresponding eigenvectors can be generated despite the intrinsic non-perturbative nature of bound state problems. [1-3] This work has been supported by the NSF, NSFC and Research Corporation.

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

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

[3] Q.Z. Lv, S. Dong, C. Lisowski, R. Pelphrey, Y.T. Li, Q. Su and R. Grobe, *Phys. Rev. A* 97, 053416 (2018).

LANDSCAPE PERFORMANCE OF ANNUAL BEDDING PLANTS TREATED WITH FOLIAR APPLICATION OF SILICON AND TITANIUM

Presenter	Pereira, Vania Maria Graduate, Agriculture
Mentor	Prof. David Kopsell
Authorship	Vania M. Pereira; David Kopsell; Jessica Chambers; Nicholas Pershey; Robert Rhykerd

The U.S. floriculture market, composed of cut flowers and foliage, propagation material, potting and bedding plants, was estimated at \$4.37 billion in 2015. Bedding plants represent the main segment, having a share of \$1.2 billion dollars. Bedding plants are produced using greenhouse production for availability of the product to match the market demand and quality assurance. This production uses several technologies, such as the use of soilless media, which provide feasibility and good physical structure for plant growth, but little or no nutritional availability. The quality of bedding plants is very dependent on an adequate nutritional fertilization. Researches have shown that besides essential macro- and micronutrients, beneficial nutrients can improve growth, development, and quality in certain growing conditions and species. Silicon (Si) and titanium (Ti) have demonstrated improvements in the quality and growth of certain bedding plants in greenhouse production but information is lacking as to whether these benefits enhance landscape performance. This research examined the greenhouse and landscape performance (plant growth and quality) of four annual bedding plants treated with foliar applications of Si and Ti in separate experiments. The four annual plant species were selected based on popularity were geranium (*Pelargonium x hortorum* 'Black velvet rose F1'), vinca, (*Catharanthus roseus* 'Mega Bloom Pink Halo F1'), zinnia (*Zinnia* hybrid 'Double Hot Cherry') and impatiens (*Impatiens walleriana* 'Accent White'). Sodium silicate (NaSiO_3) supplied by foliar treatments of 0, 50, 150 and 250 mg Si-L-1 and Ti-ascorbate (Tytanit[®]) supplied by foliar treatments of 0, 50, 100 and 150 mg Ti-L-1. This study will be conducted in two growing seasons (2018/2019) to decrease environmental effects. The treatment applications will be applied 4 weeks before plants reach the marketable size for impatiens, vinca, and zinnias, and 7 weeks for geraniums. Data will be collected before treatment application inside of the greenhouse and after transplanted to the field every 15 days. Production will follow common commercial greenhouse. The data gathered will assess growth and quality traits (height, number of leaves and flower, stem diameter and plant, days to flower, the diameter of flower, and chlorophyll content). Before frost, plants will be destructively harvested to measure fresh and dry weight. The effect of foliar applications of Si and Ti on the growth and quality traits of selected annual bedding plants in the greenhouse and landscape performance will be determined.

DRESSING FOR HER: AN OVERVIEW OF BUTCH/FEMME FASHION

Presenter	Perling, Molly Undergraduate, Theatre and Dance
Mentor	Prof. Lauren Lowell
Authorship	Molly Perling

The gay bar scene of the 1940s and 50s has been credited as being the birthplace of butch and femme as lesbian identities. With the rise of third-wave feminism in the 90s, these identities were challenged as reproductions of heterosexuality, while also being brought into the mainstream by celebrities such as Ellen DeGeneres and k.d. lang. Now, with the increasing popularity of androgyny and gender-bent fashion for both sexes, women who identify as butch or femme are developing new ways to dress in line with that identity.

This paper is an overview of the evolution of butch/femme culture in the last half-century, through the lens of their clothing choices. Drawing on previous theorists, as well as primary accounts, photographs, and personal interviews with butch and femme women, I hope to provide an introduction into how these women have used and continue to use the way that they dress to establish their identity, distinguish themselves from the mainstream, and connect to previous generations of butch/femme women.

DO JUDICIAL INSTRUCTIONS AID IN DISTINGUISHING BETWEEN RELIABLE AND UNRELIABLE JAILHOUSE INFORMANTS?

Presenter	Peterson, Morgan Graduate, Criminal Justice Sciences
Mentor	Prof. Miltonette Craig
Authorship	Morgan Peterson

Jailhouse informants (JI) are a prominent source of wrongful conviction with the least amount of oversight. The current study investigated whether judicial instructions could aid jurors in differentiating reliable from unreliable informants. The participants (N = 513) read one of seven trial transcripts (i.e., standard jury instructions with a reliable jailhouse informant) and were to provide a verdict and indicate their confidence of their verdict, rate the JI on certain characteristics (i.e., trustworthiness). We examined verdict rates and evaluations of the jailhouse informant. Though reliable JIs were rated more highly, informant reliability type had no significant effect on the verdict.

PERCEPTIONS OF BARRIERS AND PATROL CAREER INTEREST: COMPARING PERCEPTIONS OF FEMALE AND MALE STUDENTS IN CRIMINAL JUSTICE COURSES

Presenter	Peuterbaugh, Meghan Graduate, Criminal Justice Sciences
Mentor	Prof. Michael Rossler
Authorship	Meghan Peuterbaugh; Michael Rossler

The passing of the 1972 Civil Rights Act made using sex to exclude women in careers illegal, and police departments were pressured to recruit more females included in departments. Although recruitment efforts have been made by police departments to increase the number of female police officers, female officers still comprise only 12 percent of officers nationally. Research has highlighted several issues that are perceived by women as barriers to entering police careers (e.g., apprehension over entering the academy, disruption to family life, lack of mentoring and recruitment, and blocked upward mobility). While these challenges are frequently listed as barriers, little research has directly examined the impact that perceptions of these barriers have on interest in a police patrol career. Drawing upon a survey of over 640 undergraduate students enrolled in criminal justice courses across five universities, this research examined the perceptions of barriers to entering a police patrol career and the differences of these perceptions between female and male students. Additionally, this study examines whether these perceptions significantly relate to gender and interest in a policing career. Implications for policy and future research are discussed.

CONSTRUCTIVE DECAY RATES OF THE STANDARD MODEL I

Presenter

Pinto, Santiago

Undergraduate, Physics

Mentor

Prof. Neil Christensen

Authorship

Santiago Pinto; Neil Christensen; Annie Moore

We develop new tools for calculating decay rates using the recently discovered constructive techniques. We apply these to the 3-point vertices of the constructive Standard Model.

INACTIVE ELECTRON EFFECTS IN CHARGE EXCHANGE COLLISIONS

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

Scattering angle differential cross sections for the $\text{He}^+ + \text{He}$ single electron capture process are studied using plane wave Born approximation models for projectile energies between 180 keV and 1.89 MeV. Within this simplistic framework, we study the effects of the frozen core approximation by performing a full 5-Body calculation that explicitly includes all particles in the collision and comparing it with a single bound state model that neglects the bound electron in the projectile and a double bound state model that neglects the inactive electron in the target atom. Results are compared with experiment and we show that inclusion of the inactive electron in the perturbation potential is more important than inclusion in the wave functions. We also introduce a semi-quantum mechanical perturbation potential that treats the atomic electrons as a quantum mechanical electron cloud rather than point particles. The semi-quantum mechanical perturbation removes the deep, unphysical minimum that exists in cross sections calculated with Born-type models, but also has the effect of greatly reducing the magnitude of the small scattering angle cross sections.

THE HUNT FOR MISSING LANGFORD HABITATION SITES

Presenter Rahman, Yousuf
Undergraduate, Sociology/Anthropology

Mentor Prof. G. Logan Miller

The purpose of my final project is to answer the following question: Where in Illinois might we expect to discover lost habitation sites that belonged to the Langford Native Americans. This question will be addressed in my research through the pursuit of three main goals. The first research goal is to create a dataset that analyzes the geographic parameters of the Langford habitation sites that we already know of today. The second research goal is to create a map depicting the areas of Illinois that have a higher probability of yielding Langford habitation sites. The third goal is to use the new parameters and map to drastically reduce the land that needs to be searched so that an effective search may become more financially feasible.

Discovered in the early 20th century, the Noble-Wieting archeological site is the remains of a relatively large Native American village/ habitation site located on a plot of private farmland near the Kickapoo Creek in McLean County. This location is important and has been considered somewhat of an anomaly because of its artifacts as well as placement between previously determined territories of two local and potentially hostile tribes. Archeologists excavating the site found a wealth of material remains; though oddly enough they show distinct characteristics resembling the manufacturing techniques and lifestyle practices of both the Mississippian and Langford Tribes. While analyzing and archiving these artifacts, I was able to distinguish a single pottery sherd that exhibits both the Langford grit-tempered pottery style and the Mississippian shell-tempered pottery style. Upon further analysis performed by Dr. Logan Miller, it was determined that the two pottery styles were layered one over the other; indicating the possibility that the site was co-inhabited...

This speculation is important for two reasons. One reason being that researchers have been wondering whether or not Noble-Wieting was a standalone Langford village; and the other reason being whether or not this was the site where two rival cultures began to merge. Either of these possibilities implies that Noble-Wieting must be a part of a larger support network to exist so far into what was previously believed to be uninhabited territory.

This larger support network would require the existence of many more Langford settlements and villages; implying that they had a much more widespread community and presence in Illinois. If this were proven as true, it would help to uncover a large piece of America's lost history.

MULTI-LAYER PERCEPTRON NEURAL NETWORK FOR IOT BOTNET TRAFFIC CLASSIFICATION

Presenter

Rajabi, Navid

Graduate, Information Technology

Mentor

Prof. Yousra Javed

Internet of Things (IoT) is becoming an integral part of our homes today. Internet-connected devices such as smart speakers, smart bulbs, and security cameras are improving our convenience and security. With the growth in smart environments, there is an increasing concern over the security and privacy issues related to IoT devices. The issue of the IoT security has received considerable attention due to (1) the intrinsic technological constraints of IoT devices (computing and storage limitations) and (2) its prevalence in people's life's, in close proximity. IoT devices can be easily compromised (much easier than PCs and/or smart phones) and can be utilized for generating botnet attacks. We propose an Artificial Intelligent (AI) based solution for malicious traffic detection, known as Multi-Layer Perceptron (MLP) Artificial Neural Network (ANN). MLP ANN is one of the most common architectures for neural networks which has one input layer (input features), one output layer (classes or labels), and one or more hidden layers in between. MLP ANN is a fully-connected graph of these layers in which each hidden layer may contains an arbitrary number of neurons. MLP ANNs can be used for classification purposes when the dataset is labeled (also known as Supervised Learning). The MLP model needs to be trained using the training data set (a portion of the whole data set) to learn the associations between the input features and output labels. Then, the accuracy of the model is measured by testing the model using the test data set (the remaining data set which has not been seen by the model yet). In this poster, we explore the accuracy of MLP ANN in detecting botnet traffic from IoT devices infected by two major IoT botnets, namely, Mirai and Bashlite (Gafgyt). After tuning and optimization, the MLP ANN achieved an accuracy rate of 100% in testing phase for the IoT botnet traffic classification.

SEX SPECIFIC EFFECTS OF HATCHING ORDER AND SYNCHRONY ON NESTLING BASELINE CORTICOSTERONE

Presenter	Rittinger, Madison Graduate, Biological Sciences
Mentor	Prof. Charles Thompson
Co-Mentor	Prof. Scott Sakaluk
Authorship	Madison Rittinger; Charles Thompson; Scott Sakaluk;

Females in many bird species can choose to hatch their eggs synchronously, within 24 hours, or asynchronously, over a period of 2-3 days, by altering the timing of their incubation. In our study population of house wrens (*Troglodytes aedon*), these different hatching patterns have sex-specific effects on the size and condition of nestlings. In asynchronous broods, the mass of sons declines across the hatching order, but the mass of daughters remains relatively constant, whereas in synchronous broods, offspring mass of both sexes remains relatively constant across the hatching order. We know from previous work that female house wrens strategically capitalize on these effects by differentially allocating the sex of their young across the laying order. Males are more likely to hatch from first-laid eggs and least likely to hatch from last-laid eggs in asynchronous broods, whereas in synchronous broods, there is no sex bias in offspring produced in relation to laying order. We hypothesize that levels of circulating corticosterone in nestlings, the primary metabolic hormone in birds, is the means by which sex-specific differential investment arises based on previous research demonstrating that in ovo exposure to moderate levels of corticosterone have positive effects on nestling growth and condition. Specifically, we predict that (i) first-hatched males in asynchronous broods will have the highest baseline corticosterone levels, (ii) last-hatched males in asynchronous broods will have the lowest, and (iii) asynchronously hatched females, and all nestlings from synchronously hatched broods, will have intermediate levels of baseline corticosterone. We will use a population of house wrens breeding on the 130-ha Mackinaw study area in McLean County, Illinois, to characterize baseline corticosterone levels in nestlings from synchronously or asynchronously hatching broods. In a companion study, we will experimentally create “asynchronous” broods by cross-fostering single nestlings at different points of development such that otherwise synchronous broods contain one nestling that is either significantly advanced in development compared with its brood mates or significantly delayed in its development. We predict that the former will exhibit increased baseline corticosterone relative to its brood mates, whereas the latter will exhibit decreased corticosterone; we further predict that the extent of these differences will be contingent on the sex of the cross-fostered nestling. To determine nestling sex, we will extract DNA from blood samples and amplify sex-specific genes using the polymerase chain reaction (PCR). We will use a competitive-binding radioimmunoassay (RIA) to determine baseline corticosterone levels in nestling blood.

EFFECTS OF THE ANTIDEPRESSANT DRUG VORTIOXETINE ON VENTRAL PALLIDAL NEURONAL ACTIVITY, RESPIRATION AND HEART RATE IN THE RAT

Presenter	Rogers, Piper
	Graduate, Psychology
Mentor	Prof. Byron A. Heidenreich
Authorship	Piper Rogers; Byron Heidenreich

Major Depressive Disorder is a mental illness that affects many people worldwide. People diagnosed with depression are often prescribed antidepressant drugs. Antidepressants increase levels of serotonin (5-hydroxytryptamine, 5-HT) in the synapses between neurons. Selective-serotonin reuptake inhibitors (SSRIs), a class of antidepressants, do this by inhibiting the reuptake of serotonin released into the synapse.

Serotonin neurons from the brainstem raphe nuclei affect a wide range of areas throughout the brain. Among these areas is the ventral pallidum (VP), located in the basal forebrain. Citalopram, an SSRI, was found to increase the firing rate of action potentials of neurons in the VP of rats.

A novel antidepressant, vortioxetine, has been developed that has multimodal actions. Vortioxetine inhibits the serotonin transporter as previous SSRI drugs do, but also is a 5-HT_{1A} receptor agonist, 5-HT_{1B} receptor partial agonist, and a 5-HT_{1D}, 5-HT₃, and 5-HT₇ receptor antagonist. In the present study, we aim to investigate the effects of vortioxetine on neuronal activity in the VP of urethane-anesthetized rats through electrophysiological techniques. We will also examine heart rate and respiration rate, as it was shown that citalopram decreases both heart rate and respiration. We hypothesize that vortioxetine will increase the frequency of action potentials in the VP, as citalopram does. We also predict that vortioxetine will decrease heart rate and respiration rate. However, the effects of vortioxetine may differ from citalopram because of its additional mechanisms of action. The results of this study will assist in further understanding of the actions of vortioxetine as an effective antidepressant, as well continuing to determine the relationship between 5-HT neurotransmission and the VP.

OXIDOPYRYLIUM-BASED [5+2] CYCLOADDITIONS WITH KOJIC ACID-DERIVED SUBSTRATES

Presenter

Rokey, Samantha

Undergraduate, Chemistry

Mentor

Prof. T. Andrew Mitchell

Authorship

Samantha Rokey; T. Andrew Mitchell

Cycloadditions are an important reaction to synthesize ring structures that are part of many biologically active natural products. Construction of starting materials to study oxidopyrylium-based [5+2] cycloadditions requires multiple steps. First, kojic acid was subjected to chlorination. Next, the alcohol was protected as a silyl ether. Finally, enolate alkylation delivered the substrate and cycloaddition was then achieved upon heating.

NO MONEY TO GIVE, NO MONEY TO SEE: ECONOMIC INSECURITY IN BLOOMINGTON-NORMAL

Presenter

Rubio, Michael
Undergraduate, Politics and Government

Mentor

Prof. Michaelene Cox

This research project is one of a series of individual photo essays undertaken to explore economic security threats at the local level. The essay focuses specifically on economic dimensions related to risks to individual well-being and dignity in Bloomington-Normal. Studies in human security are generally regarded as interdisciplinary frameworks centered on the welfare of people, rather than conventional state-centered notions of national security and are often linked to discussions about freedom from want and freedom from fear. There are few studies that employ this concept at local levels within developed countries, and thus our community serves as a site of inquiry for this class project. My own collection of captioned photographs and accompanying narratives underscores the subjective nature in determining who defines security, what it constitutes and who is at risk, and demonstrates that perceptions of human (in) security of our own surrounding communities can be made visible through arts-based research methodologies.

MOVEMENT DYNAMICS ON SINGLE-LEG HOPPING BETWEEN INDIVIDUALS WITH AND WITHOUT CHRONIC ANKLE INSTABILITY

Presenter Sagawa, Hiroshi
Graduate, Kinesiology & Recreation
Mentor Prof. Adam Jagodinsky
Authorship Hiroshi Sagawa; Adam Jagodinsky; Mohammed Zaman;
Christopher Wilburn; Wendi Weimar

INTRODUCTION: Adaptability of the motor system indicates a successful management of chronic ankle instability (CAI). Research shows individuals with who do not exhibit residual symptoms following ankle sprain (i.e. copers) exhibit greater adaptability during walking compared to individuals with CAI. However, questions remain surrounding systemic differences exhibited by copers groups, particularly when higher movement demands are imposed on the system. Analysis of load acceptance during single-leg hopping could provide indication of the systemic movement adaptations between the groups during higher demands of movement tasks. **PURPOSE:** Examine percent contribution (%C) to support moment (MS) during single-leg hopping in healthy, copers, and CAI groups. **METHODS:** 48 individuals (16 per group) participated in the study. Participants performed 15 trials of single-leg hopping. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of the ankle, knee, and hip moments in the sagittal plane. The %C of the ankle (A), knee (K), and hip (H) moment to MS was calculated at 15 percent of stance phase. A mixed ANOVA was conducted to compare group effects for each dependent measure across time points. **RESULTS:** No significant differences in %C to MS were found between the healthy (A 81.87±18.37%, K 23.81±16.96%, H 2.22±27.19%), copers (A 73.78±23.33%, K 28.28±21.05%, H -6.51±33.17%), and CAI groups (A 83.76±17.91%, K 16.48±12.58%, H 0.78±19.71%) during the stance phase of single-leg hopping. **CONCLUSION:** Copers did not exhibit distinct kinetic patterns during single-leg hopping. This finding suggests that adaptation of movement is less likely to occur with higher demands of movement tasks following ankle injury. It is also possible that low amplitude COM displacement associated with the hopping task may not have placed an adequate constraint on the subjects to elicit adaptive strategies. More research is needed to explore how individual joint kinetic adaptations contribute to dynamic tasks across groups.

AN ANALYSIS AND HISTORY OF MINIATURE BOOKS

Presenter	Salvador, Elizabeth Graduate, Theatre and Dance
Mentor	Prof. Ann Haugo
Authorship	Elizabeth Salvador

The history of miniature books is long and varied; their popularity has fluctuated since their original emergence in the sixteenth century. They've been successfully marketed to a wide demographic and were intended for purposes ranging from convenience to luxury, or even simply for the sake of their whimsical appeal. Similarly, there has been significant diversity of content published in miniature form as well. Almanacs, prayer books, novels, plays, and more have all been produced in miniature form across the centuries. The height of miniature books seems to have come during the early twentieth century, when there was a surge in producing and collecting them. Though they are not as popular now, miniature books are still being published and bought. Their use as legitimate books has been called into question by many scholars and has been defended by others. While some hold that miniature books belong only to the realm of collectibles instead of literature, others contend that the name "miniature" is demeaning to books that simply happen to be smaller in stature, but are as valid as their larger counterparts. There is no clear answer on the matter; no one side is right and the other wrong. This leaves the researcher with the choice to either take sides or simply chronicle the debate. For these purposes, appreciating the history of these books necessitates understanding both sides of the debate, though sides will not be taken.

SCANNING THERMOELECTRIC MICROSCOPE THEORY

Presenter	Sams, Christopher Undergraduate, Physics
Mentors	Prof. Justin Bergfield
Authorship	Christopher Sams; Alex Rahe

A scanning tunneling microscope measures the charge transport into an atomically sharp tip in response to an applied voltage and has revolutionized how we “see” at the nanoscale. In response to an applied temperature difference, current flows until a voltage is built up to oppose the flow. The ratio of the voltage to the temperature difference is a measurable quantity known as the thermopower. Although thermoelectric devices are important for a variety of heating and cooling applications, we propose that the thermopower is also of interest as a microscopic observable because it is a probe of the second moment of the transport. In this work, we derive the theory necessary to describe this new microscopic technique. We also simulate several images produced by a scanning thermopower probe (SThM) and discuss the implications of the technique.

ANKLE BRACING EFFECTS ON CONTRIBUTION TO THE SUPPORT MOMENT DURING HOPPING

Presenter	Santillan, Carlos
	Graduate, Kinesiology & Recreation
Mentor	Prof. Adam Jagodinsky
Authorship	Carlos Santillan; Adam Jagodinsky; Mohammed Zaman; Christopher Wilburn; Wendi Weimar

INTRODUCTION: Ankle bracing is commonly implemented to prevent ankle sprain injuries. However, research shows ankle bracing can alter joint kinetics during a variety of dynamic tasks. Analysis of the support moment (Ms) characteristics in response to bracing could provide insight into possible global motor strategies adopted when an ankle brace is applied. **PURPOSE:** Examine bracing effects on lower extremity contributions to the Ms during hopping. **METHODS:** 16 healthy individuals participated in the study. Participants performed 15 trials of single-leg hopping during no brace (NB) and brace (B) conditions. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of ankle, knee, and hip moments in the sagittal plane. Data from the stance phase of hopping was extracted and time normalized to 0-100% of stance phase. The percentage contribution (%C) of ankle (A), knee (K), and hip (H) moment to Ms was calculated at 15, 30, 45, 60, and 75 percent of stance phase. Comparisons of percentage contribution between conditions were made at each time point using paired-samples t-tests. **RESULTS:** Analysis revealed that for K_15, %C was significantly lower during B ($19.5 \pm 4.06\%$) compared to NB ($21.76 \pm 4.42\%$) ($t = 2.228$, $p = .041$). Additionally, for K_30, %C was significantly lower during B (34.025 ± 9.14) compared to NB (35.26 ± 10.23) ($t = 2.306$, $p = .035$). No other significant differences for the study were observed. **CONCLUSION:** Bracing significantly decreased the contribution of the knee to the MS during single-leg hopping. Changes in the knee contribution to the Ms suggests that ankle bracing invokes adaptations to motor control strategies during the landing phase of single-leg hopping.

SELF-HEALING OF MATTER AIRY BEAMS

Presenter

Saxton, Torrey
Undergraduate, Physics

Mentor

Prof. Allison Harris

Authorship

Torrey Saxton; Zack Temple; Allison Harris

Following their discovery in the late 1970s, optical Airy beams have found numerous applications in technologies such as microscopy and optical trapping, many of which are based on the wave packets' unique features such as zero or minimal diffraction, self-acceleration, and self-healing. Recent advancements have shown that Airy beams can also be produced using matter waves with many of the same unique characteristics of their optical counterparts. We present here a study of the recovery time of damaged matter Airy wave packets in free space and a nonlinear Kerr-type medium. We show that in free space the recovery time increases approximately linearly with mass and is independent of other kinematical parameters such as momentum, velocity, and spatial width. In the Kerr-type medium, recovery time is decreased compared to free space and does not scale linearly with mass. In order to study matter Airy beams, we introduce the Path Integral Quantum Trajectory (PIQTr) model as a new computational tool for the study of non-relativistic, quantum mechanical wave packets and demonstrate its effectiveness in dealing with heavy particle dynamics.

MAPPING CHARLEMAGNE'S MOVEMENTS AND INFRASTRUCTURE PROJECTS 8TH AND 9TH CENTURY GAUL

Presenter	Scharwark, Brooklynn Undergraduate, History
Mentor	Prof. Kathryn Jasper
Authorship	Brooklynn Scharwark; Kelly Kurian

Using MAXQDA, a text mining software, and Geographic Information Systems (GIS), this project looks at the geography of Charlemagne's travels and the infrastructure projects he built over his reign. A translated copy of the Royal Frankish Annals (RFA) was the main primary source throughout the project but also used the Life of Charlemagne by Einhard to supplement understanding of Charlemagne. Infrastructure as defined within this project are bridges, castles, a lighthouse, and a canal he started in 793 A.D. but never completed due to weather conditions. This research began by using MAXQDA to create a system of tagging words and sentences to find spatial patterns between Charlemagne's movements and the projects and between the projects in the RFA themselves. MAXQDA, however, crashed and lost all of the research for the semester. After this crash it was decided it would not be possible to recreate the data in the time left of the semester. This project was then combined with GIS project from another class to focus on just looking at Charlemagne's movements across the empire. Continuing this research into an independent study this semester, this project is now focused on researching other primary sources, including another Life of Charlemagne written by Notker, polyptyques (inventories of resources, mainly for monasteries), and other texts from Charlemagne's reign to further study his movements around Gaul before mapping them in a GIS.

I HAVE A CUE FOR YOU: CUED SPEECH FLUENCY AND PROSODY

Presenter	Sheldon, Deirdre Undergraduate, Special Education
Mentor	Prof. Stephanie Gardiner-Walsh
Authorship	Deirdre Sheldon; Stephanie Gardiner-Walsh

Cued Speech is a modality that can be used to supplement a d/Deaf / hard of hearing child's phonemic awareness and phonics. Cued Speech is a mode of communication used to visually convey the phonological sounds of spoken language. There are 8 hand shapes associated to distinct consonant sounds. There are 8 placements associated to distinct vowel sounds. With a total of 16 cues, acquiring Cued Speech as a communication modality can be achieved through practice moving from isolated phonemes to word level combined phonemes to conversational fluency. Generally, most adults learning Cued Speech attend a one or two day workshop and learn the system over several hours. While this is a great foundational format for instructional delivery, many struggle to find a method for practicing in order to increase fluency in daily conversations. Without this fluency, d/Deaf and hard of hearing children rely on non-fluent adults as language models. Few resources have been found that address this need. Based on these needs, the instructor designed a program that follows a reading fluency pattern. This pattern starts with letter, to word, to phrase, to conversation, much as reading fluency starts with letter fluency and progresses to paragraph format. Pre-test and post-test scores indicated an average increase of syllables from 35 syllables per minute at pre-test to 60 syllables per minute post test. The greatest increase in rate came following the building of fluency at the individual phoneme level. On average, participants increased their average cued phonemes 66.3% or approximately 57 phonemes per minute. These results indicate that using methods for reading fluency is a strategy that can help fluent, adult readers practice their cue fluency after initial Cued Speech instruction. Increased proficiency from short bi-weekly practice sessions, with little follow up, indicates that adult learners can increase their Cued Speech fluency skills without arduous support needs from proficient cuers. Participants may benefit from daily independent practice.

EXERCISE AND STRESS RELIEF: THE ROLE OF MOTIVATION FOR EXERCISE

Presenter

Shilney, Nicholas
Undergraduate, Psychology

Mentor

Prof. Suejung Han

The purpose of the study is to examine whether people perceive less stress after regular exercise, and a potential moderating role of intrinsic motivation for exercise on stress reduction. The association between physical activity and increased overall general health has been well established (Blair, Jacobs & Powell, 1996). Research shows that people who engage in regular exercise or higher level of physical activities tend to maintain better mental health and lower perceived stress (Clark et al., 2014). Cognitive stress is not affected by physical fitness type, but fitness level does on those who experience high stress levels (Gnam et al., 2018).

However, feeling pressured to work out may not reduce, but rather increase stress, because that adds more work to do, rather than relieve stress. Self-determination theory (Deci & Ryan, 2000) suggests that intrinsic motivation (e.g., "I want to exercise because it is fun") increases performance and maintains the behavior much better than extrinsic motivation (e.g., "I have to work out"). Therefore, we hypothesized that people who were intrinsically motivated to exercise would have lower perceived level of stress than those who were extrinsically motivated to exercise.

This study has been approved by the university IRB. We recruited 200 participants from the University Recreation Center who attend group fitness classes. Participants will be asked to complete a paper survey that includes Perceived Stress Scale (Matheny & McCarthy, 2000), Treatment Self-Regulation Questionnaire (Exercise) and Perceived Competence (Exercising Regularly) (Deci & Ryan, 1985; Williams, Deci, & Ryan, 1999), Big Five Inventory Conscientiousness subscale (John & Srivastava, 1999), International Physical Activity Questionnaire (Patterson, 2012), and a demographic form. Data collection is complete, the analysis is underway. An ANOVA will be conducted with extrinsic vs. intrinsic motivation as an independent variable, and the discrepancy score on perceived stress before and after engaging regular exercise as the dependent variable. The study findings are expected to inform exercise and clinical professionals the effects of working out on stress management and if different types of motivation are significant factors.

THE WEIGHT OF SILENCE: QUESTIONING THE LEGITIMACY AND AGENCY OF BLACK VOICES THROUGH COMPARATIVE ANALYSIS OF THE DISCOURSES SURROUNDING ANTI-RACIST SILENT PROTESTATION IN THE US AND

Presenter

Smith, Tyler

Undergraduate, Sociology/Anthropology

Mentor

Prof. Liv Stone

This research analyzes and compares the sub-human positionality of Black persons in America and Palestinian-Israeli citizens through analysis of the wording the media and state actors use when referring to the silent protestation and civil disobedience enacted by or for the benefit of these demographics. Highlighting the lack of legitimacy and agency these groups have in the eyes of the state, provides inalienable artifacts from which we can challenge and expose the underlying racial biases of the state. Scholars posit that the post-Holocaust world welcomed a vision of heightened morality within society, if this is true, how has this surge in public consciousness for Jewish persecution not extended to Black/Brown persons? That is, why are Black/Brown lives still valued less? Is this a product of the power of the discourse utilized by the state as it trickles down to the media and the everyday citizen? Or is there a greater power at play? What does it mean to legitimately protest? Is legitimacy in protest merely a construct that exists only for the privileged? Is there room for Black/Brown persons to rupture the bounds of such a white space? What matters more in determining legitimacy, the opinion of the state or the American populace?

EFFECT OF CUSCUTA PENTAGONA PARASITISM ON SOYBEANS AT DIFFERENT STAGES OF DEVELOPMENT

Presenter	Smith, Hana Undergraduate, Biological Sciences
Mentor	Prof. Victoria Borowicz
Authorship	Hana Smith; Tim Martin; Victoria Borowicz

Holoparasitic plants are non-photosynthetic and acquire all resources from other plants. This can severely depress host growth. Research about how and when holoparasites impact the growth and defenses of host species can be especially helpful when determining how it damages common crops in the Midwestern United States. In this experiment we use *Cuscuta pentagona*, a holoparasite, and *Glycine max* (soybean), as the host. We are studying the effects of the infestation of *Cuscuta* on soybeans at three different stages of development with both low and high levels of fertilizer. The different phases allow us to observe how *Cuscuta* inhibits growth at different parts of the life cycle, including the vegetative and reproductive stages. By using two fertilizer treatments, we can determine how resource supply affects holoparasite-host interactions. We hypothesize that *Cuscuta* parasitism will suppress growth of younger soybeans more strongly than growth of older plants, because young plants have few reserves for chemically resisting parasitism and for compensating for losses to the parasite. We predict that growth suppression will be less in older plants and in well-fertilized plants.

Three sets of soybeans were germinated at 18 d intervals and later thinned to one plant per pot. Each pot is fertilized with low (0.07g N/L) or high (0.28g N/L) 20-20-20 N-P-K fertilizer weekly, starting 18 d after seeds were added to pots. A cutting of *Cuscuta* clipped from a larger plant will be added on day 60, when the soybeans are expected to be in the developmental stages V1, V4, and R1. V1 happens about 3 weeks after emergence and the first trifoliolate leaf unrolls. In V4, 4 trifoliolates have unrolled, nitrogen fixation occurs, and root growth continues. In R1, the host enters the reproductive part of the life cycle. There are flowers on the nodes of the main stem and vertical root growth increases dramatically. Additional control plants of each stage of development and fertilizer treatment will remain free of *Cuscuta*. As a measure of the defensive response of plants we will isolate the phytohormone salicylic acid (SA) in the soybean approximately 5 weeks after adding the *Cuscuta* and estimate the concentration via spectrophotometry. Subsequently, we will harvest, dry, and weigh the soybeans to determine growth response to treatments, and separately, we will measure dry mass of the *Cuscuta* to determine how age of host and nutrient supply affect performance of the holoparasite.

IONIZATION OF HYDROGEN BY TWISTED ELECTRONS

Presenter	Smozhanyk, Zoryana Undergraduate, Physics
Mentor	Prof. Allison Harris
Authorship	Zoryana Smozhanyk; Alex Plumadore; Allison Harris

Optical vortex beams have an extensive history in terms of both theory and experiment, but only recently have electron vortex beams been proposed and realized. The possible applications of these matter vortex waves are numerous, but a fundamental understanding of their interactions with atoms and molecules has not yet been developed. In this work, fully differential cross sections for fast ($e,2e$) collisions using electron vortex projectiles with small amounts of quantized orbital angular momentum are presented. A comparison is made with the fully differential cross sections using plane wave projectiles and a detailed study of angular momentum transfer is included. Results indicate that ionization by electron vortex beam projectiles is less likely than for plane wave projectiles, and for the special case of aligned collisions, the angular momentum of the incident electron is transferred directly to the ionized electron.

FACTORS INFLUENCING THE INCREASED POPULARITY OF CASH RENT FARMLAND LEASES IN ILLINOIS

Presenter

Styan, Jacob

Graduate, Agriculture

Mentor

Prof. Maria Boerngen

In recent years, cash rent leases have become increasingly popular amongst farm landowners in Illinois. Since 1995, Illinois has seen a 44% rise in cash rent lease usage in Northern Illinois, a 105% increase in Southern Illinois, and a 117% increase in Central Illinois. The rise in cash rent lease usage has been attributed to many factors such as crop yields, commodity prices, urban influence, and desire for the land. This study aims to determine which factors are the most pivotal in driving the shift toward the use of cash rent leases in Illinois. Using data from the USDA National Agricultural Statistics Service (USDA-NASS), Illinois Farm Business Farm Management Association (FBFM), and the Illinois Society of Professional Farm Managers and Rural Appraisers (ISPFMRA), the determinants mentioned above will be examined to explore the differences in the use of cash rent leases, crop share leases, and owner-operated acres. Comparisons will be made across regions in Illinois (Northern, Central, and Southern). Differences in professionally-managed land and non-professionally-managed land will be examined as well. Then, the factors mentioned above will be examined to see the correlations that they have with lease values and the corresponding trends. By doing this, the study aims to identify the biggest factors in why lease trends are so dynamic.

SELF-CONSISTENT EQUILIBRIA IN THE EARTH'S MAGNETOTAIL CURRENT SHEET

Presenter	Sullivan-Wood, Jonathan Undergraduate, Physics
Mentor	Prof. Daniel Holland

Due to the non-linear/chaotic dynamics of charged particles in the Earth's magneto tail, the equilibria structure of the current sheet is notoriously difficult to calculate. Simple analytic models can reproduce qualitatively correct magnetic fields (B-field), but for completely incorrect reasons. Additionally, the simple models cannot determine realistic densities and pressures. In this presentation, we self-consistently determine the equilibrium structure of the current sheet including the full non-linear ion dynamics. Using a test particle simulation, an input source distribution of protons is pushed through a model B-field. As each particle moves through the B-field, its contributions to the overall particle density, current, and pressure are calculated. Appropriate weightings are then used to calculate the total density, current, and pressure. Updated magnetic fields are determined from the calculated currents and compared with the input B-field. The calculated and input B-fields are mixed to produce an updated input field. This process is iterated until the calculated and input fields converge. Once the fields are convergence, the solution exhibits pressure balance in both the diagonal and off-diagonal elements of the momentum equations. We will show several examples varying both the drift velocity and temperature of the source distribution. It is found that adding low levels of noise into the system does not significantly alter the results. Finally, we allow for Boltzmann electrons, which results in an electric field near the center of the current sheet that acts to attract electrons and repel ions. This tends to increase the current sheet thickness.

FIELD TESTING OF AN MTSS PROGRAM EVALUATION MODEL: MIDDLE SCHOOL

Presenter	Swinford, Danielle Graduate, School Psychology
Mentor	Prof. Mark Swerdlik
Authorship	Danielle Swinford; Daniel Counterman; Mark E. Swerdlik

A program evaluation model for an MTSS organizational framework was field-tested at a local middle school. Using an on-line survey, this formative program evaluation assessed perceptions of teaching staff and parents including the effectiveness of the various tiers of intervention. Implementation steps of the program evaluation will also be discussed.

DIELECTRIC NANO-PHOTONICS-I: WHY PLASMONICS MEANS ALWAYS LOSS?

Presenter

Szczerba, Michal

Undergraduate, Physics

Mentor

Prof. Uttam Manna

Authorship

Michal Szczerba; Andrew Missel; Daniel Eggena; Brighton Coe;
Uttam Manna;

Nano-optics is usually associated with plasmonic structures made of noble metals to enhance the electromagnetic field on the nanoscale. However, the high level of Joule losses associated with the noble metals has always been a challenge limiting the efficiency of optical devices. In this talk, I will discuss why nanoplasmonics always means loss in metal nanostructures.

CATEGORIZING THE GENOTYPIC EXPRESSION OF DMD RELATED GENES IN BURROWING DYSTROPHIC *C. ELEGANS*

Presenter

Tamrazi, Monica
Graduate, Biological Sciences

Mentor

Prof. Andrés Vidal-Gadea

Duchenne muscular dystrophy (DMD) is a progressive neuromuscular disease that is characterized by muscular degeneration and weakness. DMD is an x-linked recessive genetic disorder that affects 1 in 3,500 males and is caused by the absence of the dystrophin protein. Dystrophin connects actin cytoskeleton to the extracellular matrix, which stabilizes the sarcolemma during muscle contraction. The absence of dystrophin may lead to muscle shearing and increased calcium levels in the sarcoplasmic reticulum. Consequently, the lack of dystrophin in DMD patients leads to progressive muscle deterioration and loss of mobility.

The nematode *Caenorhabditis elegans* possess the ortholog of the dystrophin gene (*dys-1*) in humans. Previous DMD research on *C. elegans* shows that *dys-1* mutant worms have moderate muscle and mobility decrease. This modest decline was most likely due to the choice of studying crawling behavior. To determine how exercise affects muscle cells in dystrophic worms, we developed a burrowing assay that allows us to see the extent of muscle degeneration and loss of mobility in these animals. Our results suggest dystrophic worms have loss in muscle fiber organization, muscle degeneration, mitochondrial blebbing, and increased levels of sarcoplasmic calcium.

While the burrowing assay has finally allowed us to successfully study an animal model that portrays phenotypic characteristics of DMD, there is still so much more to discover. To study how gene expression changes in dystrophic worms affect phenotypic degeneration, we are currently assessing DMD related genes, particularly those associated with contractile muscles, mitochondrial stress, and calcium handling. We predict that due to the absence of dystrophin, these DMD related genes will be upregulated or downregulated as a means to counteract muscle degeneration. To assess differences in gene expression between healthy and dystrophic worms, we will use quantitative real time PCR (qPCR) to examine changes in gene expression over time. Our preliminary data shows that calmodulin is upregulated in dystrophic day one non-burrowing worms. This data is supported by previous studies that suggest dystrophic worms have higher levels of sarcoplasmic calcium. This project will help us have a better idea with what goes on at the gene level and will give us an idea of which genes to target to help restore muscle function.

CASCADING NEURONAL SYNCHRONIZATION IN COMPUTER SIMULATIONS

Presenter	Tennant, Ben Undergraduate, Physics
Mentor	Prof. Rosangela Follmann
Authorship	Ben Tennant; Rosangela Follmann; Epaminondas Rosa

Synchronous processes are commonly found in nervous systems. These neuronal synchronicities can be beneficial or harmful, depending on the type and location of the synchronization. For instance, “good” synchronization during different sleep cycles allows our brain to go through healthy processes like memory consolidation, while on the other hand, “bad” synchronization can induce a seizure in an epileptic brain. Neuronal synchronization is therefore of great relevance and a good understanding of the mechanisms underlying the synchronous processes could be helpful in two ways in order to: (1) facilitate and stabilize synchronicity when good, and (2) prevent and hinder synchronicity when bad. Here we present results we obtained running computer simulations of networks of neurons in a variety of situations, including testing how strong a coupling between neurons should be in order to make a diversity of networked neurons to get in synchrony. Our simulations involve grids with tens or hundreds of neurons, or more, and can be computationally very intensive. In this presentation we also discuss how parallel processing can be used to expedite the calculations.

SYNTHESIS OF ALKOXYBENZIPORPHYRINS AND RELATED BENZIPORPHYRIN DIMERS

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

Carbaporphyrins are porphyrin analogs in which at least one of the pyrrole nitrogens has been replaced with carbon atoms. Although many of these structures are strongly aromatic, benziporphyrins such as **1** have no global aromatic character. Novel benziporphyrin ethers **1** have been synthesized from tripyrrane **2** and alkoxybenzene dialdehydes **3** using a '3 + 1' MacDonald-type condensation. As expected, **1a** and **1b** show no overall diatropicity but protonation afforded weakly aromatic dications. In the proton NMR spectrum for the dication, the internal CH resonance shifted upfield by 3 ppm, while the external meso-protons shifted further downfield. This synthetic strategy is being adapted for the preparation of benziporphyrin dimers **4** with various linker units, including pyrene-linked benziporphyrins.

INTEGRATION TECHNIQUES IN THE PATH INTEGRAL QUANTUM TRAJECTORY MODEL

Presenter

Turpin, Victor

Undergraduate, Physics

Mentor

Prof. Allison Harris

Authorship

Victor Turpin; 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. One of the challenges of the PIQTr model is the need to integrate a highly oscillatory function. Here we explore the application of several integration techniques for use in the PIQTr model and benchmark their computational requirements.

INFINITE DIMENSIONAL OPTIMIZATION APPLIED TO PAIR CREATION FROM THE VACUUM

Presenter

Unger, Jonathan

Undergraduate, Physics

Mentors

Prof. Rainer Grobe, Prof. Q. Charles Su

Authorship

Jonathan Unger; Rainer Grobe; Q. Charles Su

We examine the electron-positron pair creation process from the vacuum for general time-dependent external fields. By applying the framework of optimal control theory, we determine those temporal pulse shapes that can maximize the final number of created positrons for a given set of momenta. In the perturbative regime of sufficiently small pulse energies or short interaction times, we obtain analytical forms that match the computational data of the optimal fields for the chosen sets of momenta. [1-7] This work has been supported by the NSF, NSFC and Research Corporation.

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AUTOMATED UNIT CHECKING IN NEURON SIMULATIONS

Presenter

Urnikis, Scott

Mentor

Undergraduate, Physics,
Prof. Epaminondas Rosa

Authorship

Scott Urnikis; Rosangela Follmann; Epaminondas Rosa

The utility of a language, be it natural language, mathematical notation, or programming language, is to express thought to some audience. For example, with natural language, the audience is other people that we wish to share our thoughts with. We may define new vocabulary in order to extend the language and make communication easier. As long as these linguistic extensions are communicated and understood, the expressiveness of the language increases and the thoughts that we want to communicate become easier to state in the newly extended language. As another example, we may consider the units used in physics as a linguistic extension to basic mathematical notation. These units allow us to annotate numbers with information about the physical significance of those quantities. Our interest, then, is to see whether we can create linguistic extensions to computer programming languages that mirror the units found in the manual computations done by practitioners of physics. Specifically, using this proposed method, we attempt to verify the physical meaning of the quantities found using numerical methods in simulations of neurons using the Hodgkin Huxley model. We use C++ as an implementation language because it has faculties that allow us to easily extend the language so that the compiler can understand and enforce our unit annotations. It is our hope that being able to express information about units in our source code will help eliminate the same class of errors that are found by utilizing units in the manual computations.

SUPPORT MOMENT DYNAMICS ARE SIMILAR IN INDIVIDUALS WITH AND WITHOUT CHRONIC ANKLE INSTABILITY DURING HOPPING

Presenter	Vasudevaraja, Umaiyaal Graduate, Kinesiology & Recreation
Mentor	Prof. Adam Jagodinsky
Authorship	Umaiyaal Vasudevaraja; Adam Jagodinsky; Mohammed Zaman; Christopher Wilburn; Wendi H. Weimar

INTRODUCTION: It has been proposed that the development of chronic ankle instability (CAI) is related to a maladaptive cascade stemming from mechanical and/or neuromotor impairments following an initial ankle sprain injury. Contrarily, Individuals who do not exhibit recurring instability following initial ankle injury (i.e. copers) may benefit from adaptive movement strategies that allow for healthy functioning, yet the mechanisms surrounding this theory remain in question. Previous investigations have found that copers exhibit significantly greater variability in the support moment (Ms) and lower extremity joint moments compared to individuals with CAI during walking, which could indicate a mechanism by which copers adapt to both mechanical and/or neuromotor constraints relating to initial injury. However, these measures have not been explored in tasks that place greater demand on the previously injured limb. **PURPOSE:** The purpose of this study was to compare the Ms variability characteristics between healthy, coper and CAI individuals during a single-leg hopping task. **METHODS:** 48 individuals (16 per group) participated in the study. Participants performed 15 trials of continuous single-leg hopping. Position data were collected using a motion capture system, and reaction forces were obtained from force platforms. Joint kinetics were calculated using inverse dynamics, and the MS was calculated as the sum of ankle, knee, and hip moments in the sagittal plane. Variability of the MS was expressed as the percent coefficient of variation (%CV) across stance phase. A one-way ANOVA was conducted to compare %CV across groups. **RESULTS:** No differences in %CV were found across groups. **DISCUSSION:** Individuals had no change in %CV compared with the previous study of walking. The contrast in findings may be attributed to the nature of task demands placed on subjects. Specifically, the rapid and cyclic transition of loading-propulsion-loading, and low amplitude COM displacement associated with the hopping task performed in this study may not have placed an adequate constraint on the subjects to elicit adaptive strategies. Future studies investigating Ms variability characteristic should consider implementing tasks that will stress motor system adaptability.

THE EFFECTS OF PEPTIDE NEUROMODULATORS ON TEMPERATURE RESPONSES IN THE CRUSTACEAN NERVOUS SYSTEM

Presenter	Veerappan, Visalakshi Graduate, Biological Sciences
Mentor	Prof. Wolfgang Stein
Authorship	Visalakshi Veerappan; Andrés Vidal Gadea; Wolfgang Stein

Temperature perturbations affect neuronal activities by altering the intrinsic ionic conductances that underlie the electrical properties of neurons. High temperatures can lead to an excessive increase in conductance and a shunt of neuronal responses, which decreases cell excitability and eventually causes a loss of neuronal activity. Surprisingly, though, many neuronal circuits continue to function in spite of these challenges, suggesting that they possess compensatory mechanisms to overcome the detrimental effects of temperature.

In the crustacean stomatogastric ganglion even small temperature increases lead to loss of neuronal activity. Previous studies have shown that the presence of a neuropeptide released from modulatory projection neurons rescues the neuronal activity by counterbalancing the excessive conductance increase caused by high temperatures.

However, it is not clear whether this rescue mechanism is common to many neurons or an idiosyncrasy of the stomatogastric system. We address this question using primary cell cultures derived from neural tissue of the marbled crayfish, *Procambarus virginalis*. Cell cultures allow us to characterize the responses of crustacean neurons from many different origins independent from circuit influences, and to test their responses to temperature challenges. Because neuropeptides are ubiquitously present in the nervous system and marbled crayfish survive large temperature fluctuations with seemingly few effects on behavioral effects, we hypothesize that most, if not all crustacean neurons have the ability to overcome temperature perturbations and that peptide modulators enable them to do so.

To test our hypothesis we are challenging cultured neurons with temperature changes and analyze (1) the collective neuronal responses by measuring field potentials and (2) individual and collective neuronal responses using calcium imaging. Neurons will be raised under constant temperature conditions for a prolonged time period to exclude homeostatic adaptations of their temperature responses. To analyze how far cultured neurons withstand temperature fluctuations, we will compare their activities before and during a transient increase in temperature. We will determine the role of peptide modulators in temperature compensation by subjecting neurons to different modulators and observing changes in their temperature responses. We predict that, like neurons in the stomatogastric ganglion, cultured neurons can withstand fluctuations in temperature better in presence of neuromodulators. This would indicate the essential role played by the peptide neuromodulators in restoring neuronal activity when faced with changes in temperature.

THE TRAVELS OF JAIME II OF ARAGON AND ITS EFFECTS ON HIS KINGDOM

Presenter

Vega, Jesse
Undergraduate, History

Mentor

Prof. Kathryn Jasper

Looking at the itinerary of Jaime II and using both primary and secondary sources I will be comparing his movements during the early tumultuous years of his reign (1295-1298) and during his conquest of Sardinia at the end of his reign. This is to make possible correlations between his time in certain locations and major gain or loss of territory. Also, I will be comparing his time in certain locations to the number of troops, financial, or material aid he receives for his conquest of Sardinia. Along the way I will also take note of any possible important events that might have influenced either the transfer of land or his ability to gain support for his conquest of Sardinia. I will be mapping his amount of time in any city year by year alongside major land losses or gains. I will also be including any monetary, material, or troops contributions to his effort to conquer Sardinia with the time and place that he receives them from. This is to see how the presence or absence of Jaime II in a region can affect the loss or gain of land for the Aragonese Kingdom. Also, this can show if his presence in a region affects his ability to receive military support.

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

Presenter	Wall, Brendan
	Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Brendan Wall; Michael Webb

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

RELATIONSHIP BETWEEN GENES AND DIET ON LIFESPAN IN DROSOPHILA

Presenter

Watts, Isabella

Undergraduate, Biological Sciences

Mentor

Prof. Alysia Vrailas-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 organisms. In addition, a number of genes have 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. We use the p38Kb MAPK model of aging. We have previously found that p38Kb MAPK extends lifespan when over-expressed in the muscle, creating long-lived flies. We want to understand how different diets affect p38Kb MAPK-mediated longevity. To do this, we are observing the lifespan of p38Kb MAPK over-expressed flies, along with controls, when fed different diets. We are studying three different diets: standard Molasses food (MF), nutrient-reduced Bloomington food (BF), and nutrient-rich German food (GF). We propose that all flies will experience the longest lifespan on Bloomington food and shortest lifespan on German food.

DEVELOPING AN OXAZOLIDINE-2-THIONE BASED APPROACH TO THE ASYMMETRIC SYNTHESIS OF BACLOFEN, AN AGENT IN THE TREATMENT OF SPASTIC MOVEMENT DISORDERS INCLUDING CEREBRAL PALSY AND

Presenter	Wendorf, Micah Undergraduate, Chemistry
Mentor	Prof. Shawn Hitchcock
Authorship	Micah Wendorf; Shawn R. Hitchcock

Baclofen belongs to a class of medicinal agents that are structurally related as gamma-amino acids. We seek to prepare baclofen through a chiral auxiliary mediated pathway. The synthetic pathway that will be discussed on the poster includes preparation of the oxazolidine-2-thione from the commercially available L-phenylglycinol with carbon disulfide, and acylation of the thione via the Steglich reaction with bromoacetic acid and chloroacetic acid. The use of bromoacetic acid proved to be problematic due to the age and quality of the reagent. The acylation of the thione with the chloroacetic acid was more straightforward and the product could be obtained more readily via flash chromatography. Research is underway to apply this substrate in a nucleophilic substitution reaction with the lithium hexamethyldisilazane (LiHMDS) derived carbanion of benzyl nitrile. The success of the alkylation will be gauged by the level of diastereoselection observed in the 500 MHz proton NMR spectra. Hydrolysis of the addition product under catalytic imidazole conditions in an aqueous environment will generate a beta-cyano carboxylic acid that will be selectively reduced to the desired gamma-amino carboxylic acid, baclofen.

SEX TRAFFICKING

Presenter

Weth, Sidney
Undergraduate, Sociology/Anthropology

Mentor

Prof. Liv Stone

Sex trafficking is a form of human trafficking that is considered modern day slavery. Some of the biggest reasons that sex trafficking occurs is because of power dynamics, structural violence, gender inequality, and racism. This research focuses on an agency that works with survivors, changing the perspectives of lawmakers, teaching citizens about sex trafficking, the discourse that occurs when speaking about sex trafficking, and other aspects. I ask why and how sex trafficking occurs, how people are working to change laws, and how agencies are changing people's perceptions of what trafficking is.

COMPARING EFFICACY AND SAFETY OF HEPARIN VS. 0.9% SALINE FOR LOCKING CENTRAL VENOUS ACCESS DEVICES

Presenter

Wiegand, Steffani

Undergraduate, Nursing

Mentor

Prof. Michele Shropshire

Background: Occlusion is a common complication associated with the use of central venous access devices. Healthcare facilities may choose to utilize heparin, an anti-thrombotic drug, to decrease the incidence of occlusion. However, repeated use of heparin carries a number of risks, and the actual effectiveness of heparin over saline is not clear, leading to inconsistency in policies across healthcare systems.

Aim: The aim of this evidence-based practice project was to review the current literature on the use or non-use of heparin versus 0.9% saline and present a recommendation based on the available evidence.

Method: Garrard's Matrix Review Method was utilized to find and review evidence for this project. Searches were performed in CINAHL, PubMed, Joanna Briggs Institute, and Cochrane databases. Inclusion criteria were research studies, literature reviews, clinical practice guidelines, and evidence-based practice/quality improvement projects published in 2014 to 2019, with an adult population of patients with a central venous access device (CVAD) which is either a central venous catheter (CVC) or peripherally-inserted central catheter (PICC). Exclusion criteria were totally-implantable devices (ports), populations including infants and children less than 18 years of age, patients receiving chemotherapy or bone marrow transplantation, and patients receiving hemodialysis.

Results: After a review of the literature, two studies were found to support the use of heparin solution for flushing or locking central venous access devices. Six articles reported inconclusive results, and four articles discouraged the use of heparin, indicating preference for normal saline. **Conclusion:** Due to conflicting literature, the evidence is insufficient to make a practice recommendation on solution preference between heparin and 0.9% saline to maintain patency of central venous access devices. Frequent flushing with the correct method, regardless of the solution used, appears to have a more substantial impact on decreasing occlusion rates as reported among the current evidence. Limitations of this evidence-based practice project include studies with small sample sizes, therefore decreasing generalizability of findings. Recommendations for future studies include larger sample sizes and specific guidelines to be developed and implemented to standardize practice across healthcare systems.

PRE-CRASTINATION IN COGNITIVE TASKS

Presenter	Wiemer, Kristina Undergraduate, Psychology
Mentor	Prof. Dawn McBride
Authorship	Kristina Wiemer

Pre-crastination is the tendency to complete a task sooner, even if it requires exerting extra effort. This concept was first introduced by Rosenbaum, Gong, and Potts (2014) in a bucket carrying task. When participants were presented with the bucket carrying task, it was found that individuals preferred to pick up the close bucket instead of the far bucket, although picking up the close bucket meant carrying it for a longer distance and exerting more effort. In the current study, we asked whether pre-crastination occurs in cognitive tasks. Participants were given a choice to either generate a longer list of words from a given category before starting a box moving task or generate a shorter list of words from that category after finishing a box moving task. We hypothesized that individuals will be more likely to pre-crastinate (generate more items before starting the box moving task), despite the increased cognitive load than to procrastinate (generate fewer items after finishing the box moving task). Data collection is still in process, and we have a target of at least 90 participants.

RUTHENIUM COMPLEXES FOR ALZHEIMER'S DISEASE THERAPY

Presenter	Will, Mark
	Undergraduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Mark Will; Michael Webb

Alzheimer's Disease (AD) is a neurodegenerative disorder that is estimated to afflict nearly 6 million Americans. AD is characterized by Amyloid-beta ($A\beta$) plaques, which are extracellular deposits of the $A\beta$ peptide that contain copper, zinc, and iron. Metal-based drugs have shown promise in inhibiting the toxicity of the $A\beta$ peptide. Ruthenium-based (Ru) complexes such as indazolium trans-[tetrachlorobisindazoleruthenate(III)] (KP 1019), imidazolium[trans-tetrachloro(dimethyl sulfoxide)imidazoleruthenate(III)(1H-imidazole)(DMSO-S)] (NAMI-A), and (2-aminothiazolium [trans-tetrachlorobis(2-aminothiazole)ruthenate(III)] (PMru 20) have been shown to be strong candidates for AD therapy, however, a higher understanding of the activities of individual Ru complexes must be obtained for further development. To gain a stronger understanding of Ru compounds for AD therapy, we will synthesize derivatives of NAMI-A with pyridines containing differing functional groups. Preliminary data show that the pyridine-based derivatives will bind to $A\beta$, while evaluation of their impact on aggregation is ongoing. The results of this study will produce insight into the importance of the ligands around the Ru center and their impact on $A\beta$ binding.

EVALUATING THE VALIDITY OF CHILD SELF REPORT METHODS IN 6 AND 7 YEAR OLDS

Presenter

Williams, Jada
Undergraduate, Psychology

Mentor

Prof. Leandra Parris

Authorship

Jada Williams; Danielle Zaiya; Leandra Parris

The objective of this study was to determine the validity of child self-report methods. Data analysis plans and results will be shared upon completion of the study.

PREDICTORS OF HELP-SEEKING SELF-STIGMA AMONG AT-RISK YOUTH

Presenter	Williamson, Carly Graduate, Psychology
Mentor	Prof. Leandra Parris
Co-Mentor	Prof. Daniel Lannin
Authorship	Carly Williamson; Daniel Lannin; Leandra Parris; Maayan Dvir; Ani Yazedjian

Purpose

Self-stigma refers to negative self-perceptions and demoralization that occur when societal stigma regarding mental health and counseling is internalized and applied to one's self (Corrigan, 2004; Vogel, Bitman, Hammer, & Wade, 2013). While self-stigma is well-studied in college populations, less work has examined adolescents - which is unfortunate given their low rates of mental health treatment utilization (see Gulliver, Griffiths, & Christensen, 2010). Therefore, the present research explored predictors of adolescent help-seeking self-stigma. First, given the amount of time adolescents spend in school, it is possible that student perceptions of school climate may be an important environmental factor that either legitimizes stigma or facilitates help-seeking (Bos, Pryor, Reeder, & Stutterheim, 2013; Eliot, Cornell, Gregory, & Fan, 2010). Additionally, self-stigma may be influenced by one's life-goals (Seidman, Lannin, Heath, & Vogel, 2018) and their readiness to consider the need to change (Tsang, Fung, & Chung, 2010). We predicted that perceptions of school climate, intrinsic life-goals, and readiness to change would exhibit negative links to help-seeking self-stigma.

Procedure

During fall of 2018, in Champaign County, 171 youth aged 15-19, participating in the Champaign Area Relationship Education for Youth (CARE4U) program, completed pretest survey data. Participants completed questionnaires assessing help-seeking self-stigma, readiness to change, school climate, and intrinsic life-goals. Surveys were administered on tablets once parent permission and child assent were obtained.

Results

Hierarchical multiple regression analyses were conducted wherein individual difference variables relevant to therapy were entered first (help-seeking self-stigma, readiness to change, and importance of intrinsic life-goals), followed by an environmental factor (school climate). Results indicated that individual difference variables of readiness to change ($\beta = -0.15$, $p = .039$) and intrinsic life-goals ($\beta = -0.27$, $p < .001$) were significant predictors of self-stigma. When school climate ($\beta = -0.18$, $p = .025$) was added as a predictor, only intrinsic life-goals remained a statistically significant predictor ($\beta = -0.24$, $p = .001$), $R^2 = .13$.

Conclusions

We found that readiness to change and intrinsic life goals exhibit negative links to help-seeking self-stigma in adolescents. When considering the environmental factor of school climate, intrinsic life-goals exhibited greater negative links to self-stigma regarding help-seeking. It suggests that adolescents with intrinsic life-goals reflect more on personal growth and view help-seeking as a means towards approaching their goals. Supporting past findings, the present research suggests that school climate is linked to reduced barriers to psychological.

SYNTHESIS OF SUBSTITUTED CARBAPORPHYRINS FROM CARBATRYPYRRINS

Presenter	Woods, John Undergraduate, Chemistry
Mentor	Prof. Timothy Lash
Authorship	John Woods; Timothy Lash

Carbaporphyrins are porphyrin analogues in which one of the core nitrogen atoms has been replaced by carbon. These aromatic macrocycles have intriguing reactivity and readily form organometallic derivatives. Recently, a new route to carbaporphyrins was developed starting from indene and pyrrole-2-carbaldehyde 1a. Technical grade indene and 1a were refluxed in ethanol with KOH to give fulvene 2a. Subsequent reduction with LiAlH₄ afforded a related dihydrofulvene and this reacted with 1a under basic conditions to generate carbatripyrrin 3a. This key intermediate was used to prepare a series of carbaporphyrins 4 and hetero-analogues incorporating furan, thiophene and selenophene rings. However, this strategy afforded porphyrinoids with poor solubility characteristics, limiting applications for further studies. In order to overcome this deficiency, dimethyl substituted pyrrole aldehyde 1b has been used to explore the carbatripyrrin methodology. Hence, condensation of dimethylpyrrole aldehyde 1b with indene affords fulvene 2b, and further reaction with lithium aluminum hydride generated a substituted dihydroindene. The utility of this intermediate in preparing new carbaporphyrin structures is currently under investigation.

SYNTHESIS, CHARACTERIZATION AND EVALUATION OF RUTHENIUM (III) COMPLEXES FOR USE IN THE TREATMENT OF ALZHEIMER'S DISEASE

Presenter	Yawson, Gideon
	Graduate, Chemistry
Mentor	Prof. Michael Webb
Authorship	Gideon Yawson; Michael Webb

Alzheimer's disease (AD) is a dementing disorder which is characterized by the observation of protein deposits comprised primarily of the peptide amyloid-beta ($A\beta$). The progressive accumulation of $A\beta$ deposits leads to physical changes within the brain and eventually death of an AD patient. Binding of metal complexes to $A\beta$ has shown promise in modifying and inhibiting $A\beta$ aggregation. The ruthenium complex PMru20 (2-aminothiazolium [trans-tetrachlorobis (2-aminothiazole) ruthenate (III)]) has shown promise in preventing the accumulation of $A\beta$. However, the nature of the interaction between the peptide and the complex, remains unknown. Therefore, in our quest to probe the effects of Ru (III) complexes in binding to the protein, we have altered the groups around the metal center to optimize the design of structures to find out their ability to inhibit $A\beta$ from aggregating. Once the complexes have been purified, their impact and interaction with $A\beta$ was studied. The results obtained from these experiments will be discussed.

Keywords: $A\beta$ aggregation, Alzheimer, Ruthenium (III), PMru20

APPLICATIONS OF THE FIRST DIGIT LAW TO MEASURE CORRELATIONS

Presenter

Yost, Jack

Undergraduate, Physics

Mentors

Prof. Rainer Grobe, Prof. Q. Charles Su

Authorship

Jack Yost; Rainer Grobe; Q. Charles Su

The quasi-empirical 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 anti-correlations of the positions of two interacting particles in their quantum mechanical ground state. This suggests that by using this new 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] This work has been supported by the NSF, NSFC and Research Corporation.

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

EFFECTS OF LACE-UP AND SEMI-RIGID ANKLE BRACES ON POSTURAL CONTROL

Presenter	Zaman, Mohammed
	Undergraduate, Kinesiology & Recreation
Mentor	Prof. Adam Jagodinsky
Authorship	Mohammed Zaman; Adam Jagodinsky

INTRODUCTION: Ankle bracing is used commonly as an ankle injury prophylactic and has shown to be effective at reducing the incidence of ankle injury in athletic populations. However, studies have shown that ankle bracing can effect measures of balance and postural control during static single and double-leg standing tasks. Yet few studies have reported the effects of various styles of ankle braces on measures of postural control. **PURPOSE:** To compare the effects of lace-up and semi-rigid bracing on postural control during a standing task. **METHODS:** Thirty-five adults between the ages of 18-30yrs (height: $1.72 \pm 0.1\text{m}$; mass: $75.49 \pm 18\text{kg}$) participated in the study. Participants performed a single trial of dual-stance quiet standing lasting one minute during each of the following conditions: No brace (C), lace-up brace (LB), and semi-rigid brace (SRB). Trials were performed with the participant standing on a force platform collecting at 1000Hz. To assess postural control, mediolateral (ML) and anteroposterior (AP) center of pressure deviations were calculated from force platform measurements. Two repeated-measures ANOVAs were employed to assess differences in the COP deviations across conditions. **RESULTS:** Analysis revealed a significant main effect for COP deviation in the A/P direction ($F = 6.19$; $p < .01$). Pairwise comparisons indicated that AP COP deviations were significantly lower in the SRB condition compared to C ($p = .01$) and LB ($p = .01$) conditions. **CONCLUSION:** Findings from this study indicate that subjects exhibited an adaptive postural control strategy when a semi-rigid brace is applied. Reductions in COP deviations may be associated with altered sensorimotor function.

2019 Symposium

Afternoon Group Presentations

FANDOM AND SATISFYING PSYCHOLOGICAL NEEDS

Group Leader	Atkinson, Cody Undergraduate, Psychology
Group Members	Ryan Barta, Graduate, Psychology; Hannah Boatright, Undergraduate, Psychology; Sara Kurbyun, Undergraduate, Psychology, Megan Lowth, Undergraduate, Psychology; Julie Myers, Undergraduate, Psychology
Mentor	Prof. Eric Wesselmann
Authorship	Cody Atkinson; Ryan Barta; Hannah Boatright; Sarah Kurbyun; Megan Lowth; Julie Myers

Most fandom research suggests fandom is inherently social and can satisfy belonging needs for individuals. We investigated how belonging and other basic psychological needs (i.e., control, meaningful existence, and self-esteem) may be satisfied by discussing one's fandom with another person. In an ongoing study (current N = 144, anticipated final N = 200), we asked college student participants to identify the most important thing they considered themselves a "fan" of. We then asked participants to recall one of four different events: 1) a time when they had a conversation about their fan object with 1) another fan, 2) a non-fan who seemed interested (positive discussion), 3) a non-fan who did not seem interested (negative discussion), or 4) a time when they ate breakfast by themselves (control condition). We adapted measures of psychological need satisfaction, asking participants to answer them based on how they recalled feeling during the recalled event. We hypothesize that discussing fandom with a fellow fan would satisfy psychological needs the most, followed by having a positive discussion with a non-fan, and a negative discussion with a non-fan would be least satisfying. The control condition will help us determine if a positive discussion of one's fandom provides an increase in satisfaction, a negative discussion decreases satisfaction, or both.

MIDDLE SCHOOL TEACHERS' PERCEPTIONS OF TEAMING PRACTICES

Group Leader	Baldwin, Emilee Undergraduate, Teaching and Learning
Group Members	Elizabeth Kraus, Undergraduate, Teaching and Learning
Mentor	Prof. Benjamin Wellenreiter
Authorship	Benjamin Wellenreiter; Emilee Baldwin; Elizabeth Kraus

Student-oriented middle school philosophy supports interdisciplinary teacher teaming as a developmentally appropriate approach to school organization. Many middle school teams are comprised of only "core" classes, consisting of math, science, social studies, and language arts. Often, these teams do not include "specials" classes such as art, physical education, music, or computer science. Though many middle school students participate in specials classes, their teachers are not well integrated into team structures or cultures. As main venues of communication regarding students, curriculum, and school functioning, teams and their scheduled common team meeting times are integral to supporting teachers and providing students with holistic middle school experiences. A lack of frequent, common meeting time between core and specials teachers contributes to a lack of communication and may result in specials teachers feeling isolated from the wider school community. Specials teachers and the disciplines they teach are key components to the development of middle school students. Without adequate communication, these important individuals may feel disrespected and under-considered by the larger school system.

The goal of this project was to investigate specials teachers' perceptions of teaming structures and professional communication within a middle school. Specials teachers from a small urban school district participated in a survey in which they described the communication they have with their core team, ranked their satisfaction with their current teaming structures, and shared their overall thoughts about the advantages and disadvantages of teaming. Three themes emerged from their responses; discontent with teaching an extra class compared to the core teachers, disconnect in schedules with Positive Behavior Intervention Strategies (PBIS) and team days, and differences in handling student issues. Broadly, these themes reflect a disconnect between the core teachers and specials teachers within the same school. While the teaming approach is meant to strengthen communication, many teaming structures may be divisive systems that ultimately exclude valuable teachers.

A REVIEW OF PROGRAMS TO SUPPORT FOSTER PARENTS IN IMPLEMENTING LANGUAGE DEVELOPMENT STRATEGIES

Group Leader	Bima, Hanna Undergraduate, Communication Sciences and Disorders
Group Members	Carly Cheatham, Undergraduate, Communication Sciences and Disorders; Isabelle Frautschy, Undergraduate
Mentor	Prof. Ciera Lorio
Authorship	Hanna Bima; Carly Cheatham; Isabelle Frautschy; Ciera M. Lorio

Young children in foster care are at a higher risk for communication delays than are children in stable households. Educating foster parents in language development strategies is one way to prevent later language delays and/or disorders. This scoping review examined empirical studies including training or educational programs for foster parents. Each study was coded for the following: (a) study design; (b) participant information; (c) intervention strategies targeted; (d) intended outcomes for the child in foster care; and (e) the techniques used to teach foster parents the targeted intervention strategies. The results of this review may support researchers and other professionals in designing interventions that not only support the general development and mental health of children in foster care, but also successfully enhance language development, preventing further language delays or disorders as well as later difficulties in academics and beyond.

PERCEPTION OF LENGTH AND HEAVINESS OF RODS UNDER DIFFERENT CONDITIONS

Group Leader	Bjerga, Ellen Undergraduate, Psychology
Group Members	Dorothy Taylor, Undergraduate, Psychology
Mentor	Prof. Jeffrey Wagman
Authorship	Ellen Bjerga; Dorothy Taylor

One of the most common everyday activities is holding and manipulating objects. Doing so not only allows us to perform a wide variety of behaviors with those objects, it also allows us to perceive a wide variety of properties of those objects. For example, even without the aid of vision and when holding or supporting only a portion of a given object, people can perceive properties such length, width, shape, orientation, grasp position, and heaviness of that object. Moreover, they can do so even when that object is held or supported in various configurations of a number of different body parts. We present the results of an experiment investigating perception of length and heaviness of objects that are wielded freely, held stationary, and merely supported. We expected that participants will be able to perceive both properties in all three conditions but that participants will be better able to perceive heaviness in the free wielding condition than in the other two conditions.

SUSTAINABLE ENERGY PATHWAYS FOR DOUGLAS AVE UNITED METHODIST CHURCH (DAUMC)

Group Leader	Bohlmann, Brian Undergraduate, Technology
Group Members	Quinn Butler, Undergraduate, Technology; Sergiu Tuluca, Undergraduate, Technology
Mentor	Prof. Jin Jo

The Douglas Ave United Methodist Church (DAUMC) in Springfield, IL is leading their community by example in the fight against climate change. They have recently installed LED lighting throughout their building, and are currently looking at installing solar arrays atop their roof surfaces. The organization is also considering other energy conservation options such as geothermal heating and window retrofitting. Their end goal is to decrease their overall energy consumption in an economically feasible way. Considering their status as a nonprofit religious organization, the DAUMC will not be eligible for certain grants and incentives. Our group's contact, Dr. Todd Lafrenz, and other board of trustees members have recruited us to help further their efforts and ensure they are on the right track. Our group's goal is to establish a plan that, within the timeframe, reduces the church's overall energy consumption while providing a relatively low payback period. We intend to secure funding for the church's solar arrays through applying for several grants and other incentives. We intend to begin their plan with a solar installation. The energy savings generated from this array will be used to fund future conservation projects. We also aim to create a phase-out plan for their current HVAC and water heating systems for when they need to be replaced with more efficient models. The DAUMC has also expressed interest in forming a "green literacy" program at the church to increase the general awareness of climate change and how to fight it. All of our efforts, as well as the churches, will be documented to ensure transparency and accountability, as well as to potentially serve as a reference for other organizations in the future.

SOLAR POWER GENERATION AT ILLINOIS STATE FARM: STRATEGY, FINANCE, & IMPLEMENTATION

Group Leader	Boyd, Andrea Undergraduate, Technology
Group Members	Paul Rypkema, Undergraduate, Technology; Kyle LaFlame, Undergraduate, Technology
Mentor	Prof. Jin Jo

Time and research were dedicated to establishing the feasibility of a parallel generation solar project on Illinois State's Farm. Parallel generation, also known as behind-the-meter generation, is a renewable energy system uniquely designed and built for a single facility. This promotes the transformation towards renewable energy, as well as providing energy to the farm itself. Data was collected such as, available land on the farm, location of the meter, utility bill usage, technical measurements for the layout of design, financial options, and advice from other institutions' solar farm. We interviewed the ISU Farm Manager, University of Illinois' Solar Farm Manager, an ISU financial advisor, and used propositions from a solar development company. After the technical assessment of the potential sites, including roof, farmland, and open space, the size of the solar farm was determined. Next, the solar design and layout were constructed in order to maximize electrical outputs by comparing different solar mounting options including fixed, single-axis, and dual-axis tracking systems. The different options to finance the project, such as ISU ownership or Power Purchase Agreement (PPA) with Wabash Electric and Shine Development, were analyzed and compared after conversing with one of Illinois State's financial representatives. The incentive applied to the project are the Solar Renewable Energy Credits (SREC) through the state's Adjustable Block Program (Illinois Shine). The results projected a feasible plan that provides enough energy for the needs of the ISU farm. What makes this project unique is that it could lead to the biggest solar farm on ISU's property which is a positive step towards being a sustainable institution.

EXAMINING THE SUITABILITY AND TECHNO-ECONOMIC FEASIBILITY OF PHOTOVOLTAIC SOLAR AT ISU'S BUS SHELTERS

Group Leader	Budde, Michael Undergraduate, Technology
Group Members	Jade Pecci, Undergraduate, Technology; Ben Cunnar, Undergraduate, Technology
Mentor	Prof. Jin Jo

The Illinois State University campus relies heavily on local bus transportation for students who live in dorms that reside an extended distance from campus. This study contains an examination of the implementation of solar photovoltaic (PV) modules onto the bus stop rooftops to power internal stop/station electronics, as well as provide other quality of life services to local transportation users. Solar PV systems are highly beneficial for communities to incorporate PV onto empty roof space and applicable surfaces, and the unused surface area of bus shelters provides an excellent opportunity for additional solar power production. The construction of additional bus shelters at frequently used bus stops as well as building photovoltaic arrays on already existing shelters could provide elevated amenities for waiting bus riders. This potential upgrade would allow the riders more comfort and ease of access while demonstrating the applicability of PV and related technology into everyday life within the community. The methods used in this study focused on the economic prospects not only on the construction of new bus stops but also on the renovation of existing stations, particularly on those around the Illinois State University campus. Energy production estimations and the many benefits to riders are also discussed in this feasibility study.

BRAINSTEM NEURONAL C-FOS EXPRESSION IN A RAT MODEL OF PANIC DISORDER: EFFECTS OF METERGOLINE INJECTION INTO THE AMYGDALA AND SODIUM LACTATE

Group Leader	Cam, Yonca Graduate, Psychology
Group Members	Ashley Adams, Graduate, Psychology; Adam Snell, Undergraduate, Psychology,
Mentor	Prof. Byron A. Heidenreich
Authorship	D. Adam Snell; Ashley Adams; Yonca Cam

Panic disorder (PD) is an anxiety disorder with a number of physical symptoms, including the sensation of rapid heart rate and the respiratory symptom of rapid shallow breathing. These symptoms can be induced in people diagnosed with PD by an intravenous (i.v.) injection of sodium lactate (NaLac). Dysregulation of the neurotransmitter serotonin is thought to be one of the correlates of anxiety disorders, including PD, and some drugs that treat anxiety disorders alter serotonin levels in the brain. In animals, NaLac is not sufficient to produce panic-like responses without an additional treatment. Inhibiting signaling by the neurotransmitter GABA in the basolateral amygdala (BLA) of rats produces NaLac-induced tachycardia (rapid heart rate) and faster breathing rate. These symptoms of PD in rats can also be produced by injection of the serotonin receptor antagonist drug metergoline (MET) into the BLA, which likely disrupts GABA signaling. Previously, we showed that injection of MET into the BLA and NaLac i.v. is sufficient to produce tachycardia and rapid breathing in anesthetized rats. These NaLac-induced PD symptoms may be associated with the expression of the protein c-fos in cells in the parabrachial nucleus (PBN), a brain area that plays a role in regulating respiration and heart activity. Thus, we are examining the number of c-fos expressing neurons in the PBN in rats that received metergoline (or vehicle control) and NaLac i.v. (or mannitol control).

Brain sections were stained for c-Fos using immunohistochemical methods, using an anti c-fos primary antibody and the avidin-biotin-peroxidase procedure for visualizing the primary antibody. Brains were photographed using a digital microscope camera and c-fos expressing neurons were manually counted using PC software. We are currently examining the effects of the metergoline and NaLac treatments on the number of c-fos expressing neurons in the PBN. Preliminary analyses suggest that there were no differential effects of the treatments on the quantity of PBN neurons stained for c-Fos.

TRAUMA-INFORMED PROGRAM FOR PROMOTING SUCCESS

Presenter	Charczuk, Patricia Graduate, School Psychology
Group Members	Jessica Foley, Graduate, School Psychology; Taylor Lingle, Undergraduate, Psychology; Hannah Paullin, Undergraduate, Psychology; Lauren Smith, Undergraduate, Psychology; Jenae Vaughn, Undergraduate, Psychology; Kaitlyn Stout, Undergraduate, Psychology; Aaron Neitzel, Graduate, School Psychology
Mentor	Prof. Leandra Parris
Authorship	Patricia Charczuk; Jessica Foley; Taylor Lingle; Hannah Paullin; Abigail Pruitt; Lauren Smith; Jenae Vaughn; Kaitlyn Stout; Aaron Neitzel; Leandra Parris

Research suggests that there is a great need for evidence-based, trauma-informed approaches within school settings for students who are at-risk for social, emotional, and/or behavioral problems (Ridgard, Laracy, DuPaul, Shapior, & Power, 2015; Brock et al., 2016). Approximately 25-68% of students have reported some form of trauma (Costello, Erkanlie, Fairbank, & Angold, 2002; Copeland, Keeler, Angold, & Costello, 2007) that included reports of terrorism, child maltreatment, witnessing aggression or violence, or the death of a loved one (Rossen & Hull, 2012). Research suggesting that children are at greater risk for trauma than previously believed, combined with the understanding of trauma-informed care as an approach to healthy living, illustrates the benefits of having trauma-informed care integrated into school-based services. Participants included 24 sixth through eighth grade students attending a public junior high school, who were referred for the program for a variety of reasons by their school counselors. Researchers delivered weekly trauma-informed lessons surrounding school climate, emotion regulation, learning skills, and friendships over the course of one school year. Each participant completed a pre- and post-test survey to measure changes in their functioning and most offered qualitative feedback about the program during focus groups at the end of the year. According the survey data, researchers found a significant increase in social/civic learning from pre-test to post-test. Focus group data included real-life examples from the students about how what they learned impacted their social-emotional and behavioral functioning, as well as student feedback on the implementation and structure of the trauma-focused groups.

PAPAL AND IMPERIAL TRAVELS DURING THE 11TH CENTURY

Group Leader	Curtsinger, Mersi Graduate, History
Group Members	Elizabeth Harkert, Graduate, History; Kylie Eastman, Graduate, History
Mentor	Prof. Kathryn Jasper
Co-Mentor	Prof. Adam Franklin-Lyons
Authorship	Mersi Curtsinger; Kylie Eastman; Elizabeth Harkert

Movements of German emperors and the Popes of the Middle Ages have not been thoroughly studied by scholars; however, it is an important aspect of medieval history. The limitations that the lack of scholarship provide are exponential. The purpose of this study is to provide a visual representation of the two main types of figureheads during this era: Popes and Emperors. By following the itineraries and examining the correspondence from this period allows us to see the locations of the palaces and how the Popes and Emperor interacted with the nobles, and possibly each other, as they traveled around Europe. There is a network of connections that the letters and itineraries show, and through mapping, we can see how the network changed over time. Our project will produce new itineraries and maps for further analysis of the networking of the Popes and German emperors of the Middle Ages.

LONGEST MINIMAL ZERO-SUM SEQUENCES OVER AN INTERVAL

Group Leader	Espe, Nick Undergraduate, Mathematics
Group Members	Jeremy Corry, Undergraduate, Mathematics; Damian DeDivitis, Undergraduate, Mathematics; Max Ward, Undergraduate, Mathematics
Mentor	Prof. Papa Sissokho
Authorship	Max Ward; Damian DeDivitis; Jeremy Corry; Nick Espe;

A zero-sum sequence is a collection of integers that sum to 0 (e.g., $\{5,-3,-2\}$). A zero sum sequence is minimal if it does not (properly) contain another zero sum sequence (e.g., $\{4,1,-2,-2,1\}$ is not minimal).

The main question question for this project is to determine longest minimal zero-sum sequence if all the numbers involved from the sequence are taken from the range $[-t,k]$ for some positive integers t and k .

ENVIRONMENTAL IMPACTS OF MARIJUANA CULTIVATION AND PROCESSING

Group Leader	Fiddes, Kelsey Undergraduate, Health Sciences
Group Members	Summer Corsolini, Senior, Health Sciences
Mentor	Prof. Liangcheng Yang
Authorship	Kelsey Fiddes; Summer Corsolini

Marijuana agriculture is a multi-billion dollar industry in the United States. Large scale cultivation and processing of marijuana could cause significant environmental impacts. This study reviews the current impacts on air, water, soil, and energy, and envisions future changes.

DEVELOPING A CLEAN ENERGY PROGRAM TO PROVIDE LOW-INCOME AND ENVIRONMENTAL JUSTICE COMMUNITIES ACCESS TO ENERGY FROM EXISTING SOLAR PV INSTALLATIONS

Group Leader	Hieb, Nicholas Undergraduate, Technology
Group Members	Dallas Nichols, Undergraduate, Technology
Mentor	Prof. Jin Jo

Low-income residents often use a disproportionate amount of their income to cover basic needs and lack access to clean energy with their limited resources. This can be especially true during the hot summer months, when many homes are running additional cooling systems or fans. To help reduce this cost for low income residents, we propose a program which uses either the excess generation or a predetermined portion, such as 20%, of the energy produced by local residential and commercial solar PV systems to lower the energy bills of low income residents by utilizing net metering. Those who own a solar PV system can opt to donate their excess or predetermined portion of energy for use by the program, which in turn applies this energy towards qualifying low income residents' bills within the same utility. To qualify as a recipient, a resident's income must be less than 150% of the federal poverty level but also not be receiving aid from section 8 housing authorities or similar programs. Public policy may have to be passed in order to allow the claiming of tax credits equivalent to the retail rate value of donated energy. We expect such a program would benefit the recipients of the utility bill credits by reducing their utility costs, the donor who receives tax credits in exchange for the energy, solar developers who can worry less about over-sizing a system and producing excess energy on a wasteful level, and utilities whose Renewable Portfolio Standards goals will be easier met with larger residential installations.

THE EFFECT OF ECTOPIC ACTION POTENTIALS ON SENSORY BURSTS DEPENDS ON THE RATIO OF THEIR FREQUENCIES

Group Leader	Igel, Alex Undergraduate, Biological Sciences
Group Members	Maisam Yousef, Undergraduate, Biological Sciences
Mentor	Prof. Wolfgang Stein
Authorship	Alex Igel; Maisam Yousef; Margaret DeMaegd; Wolfgang Stein;

Animals rely on sensory neurons to encode and transmit information about their environment. Sensory information is encoded in the form of action potentials generated in peripheral dendrites and propagated along axons to the central nervous system. However, axons can also generate secondary (ectopic) action potentials in locations separate from sensory encoding sites. Yet, unlike sensory action potentials, which travel orthodromically towards the central nervous system, ectopic action potentials can travel antidromically towards the periphery. Our lab has previously shown that when ectopic action potentials travel backward into the sensory dendrites they alter how sensory information is encoded. Specifically, we used the crustacean anterior gastric receptor neuron (AGR) - a proprioceptive sensory neuron that elicits two kinds of action potentials: 1) backward traveling ectopic ones and 2) orthodromically traveling ones that occur in bursts. AGR senses tension of two large muscles in the animal's stomach when the animal chews and encodes it as high frequency (~20-30 Hz) bursts of action potentials in its sensory dendrites. In the absence of tension, low frequency (~2-10 Hz) tonic ectopic action potentials are generated. The frequency of these back-propagating action potentials depends on other sensory pathways, which release neuromodulators near an ectopic action potential initiation site on the axon. Our previous studies demonstrate that AGR's sensory burst depends on the frequency of back-propagating ectopic action potentials.

To understand the general mechanisms by which ectopic action potential frequency influences neuronal encoding, we created a model neuron that produced ectopic and bursts of action potentials like AGR, but did not include all AGR-specific channels. Instead, its generic structure and channel complement made it a good representation of neurons in many animals. We hypothesize that the effects that ectopic action potentials have on the encoded burst depends on the ratio between ectopic and burst firing frequencies. To test this, we changed the ectopic firing frequency, while keeping the burst constant, and vice-versa, which changed the ratio. To determine changes in encoding, we measured burst duration and number of action potentials in the burst. Preliminary data suggest that as the ratio increased the number of action potentials in the burst decreased. Our results thus indicate that the relationship between burst and ectopic firing frequencies determines the strength of the influence ectopic action potentials have on encoding.

COMBATING STUDENT FOOD INSECURITY: AN EXAMINATION OF THE USAGE, KNOWLEDGE, AND OUTREACH OF THE SCHOOL STREET FOOD PANTRY

Group Leader	Kozak, Bethany Undergraduate, Health Sciences
Group Members	Alyssa Tipsword, Undergraduate, Health Sciences; Elizabeth Bello, Undergraduate, Health Sciences; Joella Gillespie, Undergraduate, Health Sciences
Mentor	Prof. Jacqueline Lanier
Co-Mentor	Kerri Calvert, ISU Health Promotion and Wellness
Authorship	Bethany Kozak; Alyssa Tipsword; Elizabeth Bello; Joella Gillespie

There is limited information about the level of food insecurity among US college students. A recent review by the US Government Accountability Office (2018) of 31 studies on food insecurity among college students showed a wide range with 9% to over 50% students being food insecure. The purpose of this study was to assess the campus-wide knowledge and use of the School Street Food Pantry. The School Street Food Pantry is an organization that is dedicated to providing college students in the local community with food, supplies, and nutritional knowledge. To better understand the disparity between students who report experiencing food-insecurity and current users of the School Street Food Pantry, research methods included: collecting survey data on potential barriers to pantry use by students, interviewing faculty and administration members on their knowledge of food insecurity rates on campus, and conducting observations during board meetings and listening sessions to better understand the pantry's dynamic and role within the community.

MONITOR TYPE: PARTICIPANT EVALUATIONS OF TWO TYPES OF ACTIVITY TRACKING DEVICES DURING A WALKING INTERVENTION

Presenter	Miller, Ann
Group Member	Undergraduate, Kinesiology & Recreation
Mentor	Lauren von Schaumburg, Graduate, Kinesiology & Recreation
Authorship	Prof. Anna Rinaldi-Miles
	Ann Miller; Anna Rinaldi-Miles; Lauren von Schaumburg

Physical activity tracking devices have gained popularity with mixed results. One potential factor may be participants' perceptions and preferences of the type of activity monitor. **PURPOSE:** The purpose is to investigate usage and adoption issues as well as the perceived impact for two types of activity trackers. **METHODS:** A 2-arm randomized trial was used to compare the influence of type of data engagement on activity with two types of activity monitors: 1) a hip accelerometer (New Lifestyles 1000) (n = 19) requiring manual logging (MANUAL) and 2) a wrist accelerometer (Fitbit Charge 2) (n = 19) with digital logging (DIGITAL). Participants wore the activity trackers for four weeks with instructions to meet daily step goals. At the end of the study they completed an online questionnaire evaluating their experiences with the activity trackers. The open-ended question responses for each participant were analyzed qualitatively by a content analysis. Meaning units (n = 166) from responses were coded and organized into categories and sub-categories. **RESULTS:** For both MANUAL and DIGITAL groups, the top identified categories regarding the perceived impact of the devices were 1) awareness of daily activity patterns (n = 28), 2) influenced motivation (n = 15), and 3) enhanced intuitive understanding of activity (n = 14). Differences between groups were found in prominent themes related to usage and adoption. The MANUAL users identified three themes equally: 1) concern about security of device while wearing (n = 8), 2) issues with ease of wearability (n = 8), and 3) positive experiences (n = 8). The DIGITAL users identified top themes: 1) no issues (n = 8) and usability problems (n = 8) equally, and 3) questioning accuracy (n = 6). **CONCLUSION:** Participants in both groups identified similar themes related to the impact of the devices indicating the both types of trackers were found to be perceived similarly impactful. Differences emerged in usage and adoption. Users of both types of trackers identified negatives and positives to tracker type indicating the importance of matching tracker type with personal preferences to maximize usage.

VISIBILITY OF SPECIALIZED SERVICES FOR OLDER ADULTS ON HOSPITAL WEBSITES

Group Leader	Mojadam, Ali Graduate, Business Administration
Group Members	Emily McMahon, Graduate, Business Administration
Mentor	Prof. Brenda Johnson
Co-mentor	Prof. Myoung Jin Kimsteve

Population demands on health care are changing. As a society, we are facing a massive wave of persons aging into the need for geriatric and older adult care services. The growing Medicare population has created a widely recognized need for hospitals to deliver safe, effective, and patient-centered care. Age-friendly Health System is an initiative spearheaded by the Institute for Healthcare Improvement with the goal of developing an "age-friendly framework" that will be adopted by 20 percent of U.S. hospitals and health systems by 2020 (Fulmer, Mate & Burman, 2017).

The current study explores health care providers' response to this growing need through a digital marketing lens, utilizing exploratory and descriptive methods to examine the visibility of geriatric services and specialization in older adult care on hospital websites. As consumers increasingly use websites for identifying products and services, we ask the question-are specialized services for the older adult as visible as other specialty services, such as those in obstetrics and maternal care? A binary matrix was developed for collecting data about the extent and ways by which geriatric services are displayed on hospital websites. Results suggest important implications about the perceived value of these services to health care providers, and the potential impact on the older adult population.

Fulmer T, Mate KS, & Berman A (2017). The age-friendly health system imperative. *Journal of the American Geriatric Society*, 66(1): 22-24.

MICROAGGRESSIVE EXPERIENCES AMONG HIGH SCHOOL STUDENTS AND SCHOOL PERSONNEL

Group Leader	Pavon, Julie Graduate, Psychology
Group Members	Kara Ciccirelli, Graduate, Psychology; Samantha Fillmore, Graduate, Psychology; Kirstin Johnson, Graduate, Psychology
Mentor	Prof. Brea Banks
Authorship	Brea Banks; Julie Pavon; Kara Ciccirelli; Samantha Fillmore; Kirstin Johnson; Brooke Ferrero; Steven Landau

Microaggressive exchanges are part of everyday life for people of color and LGBTQ individuals. However, few researchers have examined the microaggressive experiences of adolescents in the school setting. Researchers will present the results of a study surrounding race-and LGBTQ-based microaggressive experiences of high school students and school personnel. Attendees will gain insight into a best practice model for conducting needs assessments that may inform interventions to improve school climate.

THE ROLE OF WORKING MEMORY IN DIRECTION GIVING AND WAYFINDING

Group Leader	Powers, Victoria Undergraduate, Psychology
Group Members	Leanne Mordan, Undergraduate, Psychology; Darin Roberts, Undergraduate, Psychology
Mentor	Prof. Alycia Hund
Authorship	Victoria Powers; Leanne Mordan; Darin Roberts; Jessica Bette

Finding your way and communicating directions are important aspects of people's everyday lives. These complex activities rely on working memory, which is necessary for keeping things in mind while simultaneously performing other tasks. Baddeley and Hitch's model of working memory includes four parts. The central executive is the main control center of working memory. The visuo-spatial sketch stores visual semantics like visual and spatial details, while the phonological loop stores verbal information such as language. The episodic buffer is the component capable of holding temporary multidimensional chunks of visual and auditory information (Baddeley, 2009). It has been found in past research that wayfinding directions were less accurate when visuospatial working memory was being taxed by a secondary task. Wayfinding times were also found to be slower when visuospatial memory was being taxed (Hund, 2016). The present study investigated the role of working in direction giving and wayfinding in an outdoor environment. The sample consisted of 123 participants recruited from Illinois State University. We tested the role of working memory in direction giving and wayfinding through a dual-task methodology. The dual tasks included distinguishing between authentic or fictitious English words (taxing verbal working memory) or making decisions about times on a clock (taxing visuospatial working memory) while simultaneously giving directions or finding the best route to a specific destination on the university quad, compared to simply giving directions or wayfinding. Data on gender, wayfinding attitudes and preferences and working memory capacity also were collected through a survey, circle point task procedure, and digit span task. We expected more efficient direction giving and wayfinding performance from participants with greater working memory capacity. Furthermore, we predicted that wayfinding and direction giving would be less effective during trials when working memory was engaged in verbal and visuospatial dual-tasks compared to the single task control trials of just giving directions or wayfinding, given that dual-tasks tax working memory. These findings would reinforce that working memory is important in direction giving and wayfinding while also providing valuable information on how individuals communicate directions and find the best route to specific destinations in an outdoor environment.

EVALUATING THE ENVIRONMENTAL SUSTAINABILITY AND FEASIBILITY OF A PROPOSED SOLAR FARM IN RURAL LIVINGSTON COUNTY

Group Leader	Reis, Alexander Undergraduate, Technology
Group Members	Bryce Clark, Undergraduate, Technology; Ben Chvatal, Undergraduate, Technology
Mentor	Prof. Jin Jo
Authorship	Alexander Reis; Bryce Clark; Ben Chvatal

The consumption of any type of energy source is closely related to environmental sustainability issues including global greenhouse gas emissions and air pollution at regional and national scales. We propose to develop a framework which can evaluate the environmental sustainability of renewable energy projects. The evaluated items are environmental air quality impacts, carbon reduction potential, water quality, land use change, biodiversity, noise, toxic chemicals and recycling plans. Based upon the developed evaluation framework, the proposed project examines the impacts a solar farm would pose to the local ecosystem. An environmental sustainability assessment framework will help guide our land owner through the process as well as any other landowners interested in developing similar projects. We feel it is important to the industry to present a detailed plan, exploring both financial costs and externalities of a solar farm to expand the available knowledge base. Our research includes accurate estimates of the tradeoffs between carbon sequestration from soybean crops and the amount of generation a solar PV farm will offset compared to traditional fossil fuels. To accomplish this, we have calculated how much carbon dioxide is absorbed annually in our 34.5-acre soybeans plot providing us with its preexisting total carbon reduction estimate. This coupled with other environmental impacts have detailed how our plan will affect the local ecosystem and that of nearby landowners. Our main objective is to incentivize landowners looking to not only find a profitable use of rural land, but to also provide a long-term solution to societies ever increasing need for sustainable energy.

Keywords: Sustainable Solar Farm, Feasibility and Local ecosystem, Carbon reduction potential, Environmental Sustainability Assessment Framework

OBJECT AFFORDANCE: ARE ATTEMPTED ROLE DIFFERENTIATED BIMANUAL j

SUSTAINABLE USE OF WASTE GLASS IN CONSTRUCTION MATERIALS

Group Leader	Singh, Saurabh (Mobi) Graduate, Technology
Group Members	Michael Boffa, Undergraduate, Technology; Joseph Aderoju, Graduate, Technology
Mentor	Prof. Pranshoo Solanki
Authorship	Saurabh Singh; Michael Boffa; Joseph Aderoju; Pranshoo Solanki; Tom Bierma; Guang Jin

Sustainability represents a balance that accommodates current human needs without diminishing the health and productivity of natural systems, and without diminishing the ability of future generations to accommodate their own needs. Sustainable construction brings many benefits to our society, environment and economy. Construction sector is major contributor to carbon dioxide emissions. Consequently, a sustainability concern in construction sector becomes utmost important. In this respect, many studies used recycled materials in construction materials to implement the sustainability. This study summarizes various studies that utilized recycled waste glass in the construction materials. Specifically, use of recycled glass in Portland cement concrete as cementitious material, sand/fine aggregates, and coarse aggregates will be presented in detail. Further, use of recycled glass in other construction materials such as asphalt concrete, mortar, pavement aggregate base, self compacting concrete, flowable fill, and ultra high performance green concrete will be presented. Additionally, practical challenges in using glass and criteria required for glass to be used in construction materials will be discussed.

PREDICTING ONLINE MENTAL HEALTH INFORMATION-SEEKING AMONG AT-RISK YOUTH

Group Leader	Sutherland, Shannen Undergraduate, Psychology
Group Members	Rachel Geary, Undergraduate, Psychology
Mentor	Prof. Daniel Lannin
Co-Mentors	Prof. Leandra, Parris, Ani Yazedjian, Family and Consumer Sciences
Authorship	Daniel Lannin; Maayan Dvir; Rachel Geary; Leandra Parris; Ani Yazedjian; Shannen Sutherland

A. Purpose

The purpose of the present study is to examine whether mental distress and self-stigma predict online mental health information-seeking in at-risk youth. Seeking such information is important because it is the initial step taken in addressing mental health concerns (Oh, Jorm, & Wright, 2009). There is evidence that increased mental distress is a primary motivating factor behind seeking online mental health information, whereas self-stigma (the internalization of negative societal beliefs about help-seekers) may be a barrier (Lannin, Vogel, Brenner, Abaham, & Heath, 2016). However, research has not examined these relationships in at-risk youth, a population for whom mental health literacy and openness to mental health information may be particularly relevant, which is the aim of the current study.

B. Procedure

During fall of 2018, in Champaign county, 171 youth aged 15-19, participating in the Champaign Area Relationship Education for Youth (CARE4U) program, completed pretest survey data. Participants completed questionnaires assessing distress and self-stigma. They were then offered to decide whether to read information about mental health concerns such as depression and anxiety. Surveys were administered on tablets once parent permission and child assent were obtained.

C. Results

To aid interpretation of results, (a) self-stigma scores were standardized, and (b) a clinical level of distress was calculated from Kessler's k6+ distress measure (Kessler et al., 2002) wherein 1= low distress, 2= moderate distress, and 3= severe distress (cf. Prochaska, Sung, Max, Shi, & Ong, 2012). Multiple logistic regression analysis was conducted, with level of distress entered at step 1 and self-stigma entered as step 2. Level of distress was a significant predictor of whether students opted to read more mental health information ($b = .86, p < .001, eb = 2.37$). This result indicates that increases from low distress to moderate distress (or from moderate distress to high distress) increase the odds of deciding to read online mental health information by 2.37, controlling for self-stigma. Contrary to the hypothesis, self-stigma was not a statistically significant predictor of pursuing mental health information ($\beta = -0.21, p = .22, eb = 0.81$). An exploratory test of the interaction between distress and self-stigma was non-significant, $p = .301$.

D. Conclusions

The present study found that distress was a positive predictor of decisions to seek online mental health information; however, contrary to expectations, self-stigma was not predictive. It is possible that other factors besides self-stigma may constitute help-seeking barriers, suggesting the need for additional research within this population.

BOTTLE-FED INFANT WITH MYOTONIC DYSTROPHY: A CASE STUDY

Group Leader	Szramek, Allison Undergraduate, Communication Sciences and Disorders
Group Members	Kathleen McMillion, Undergraduate, Communication Sciences and Disorders
Mentor	Prof. Taeok Park
Authorship	Allison Szramek; Kathleen McMillion; Taeok Park

Introduction Myotonic dystrophy (MD) is a neuromuscular disease and is characterized by myotonia in combination with progressive muscular dystrophy and multiple systemic complications. The main indicator of difficulties is often times dysphagia. The purpose of the study was to determine clinical features and temporal characteristics of swallowing in infants diagnosed with myotonic dystrophy. **Methods** The subject was a five-month-old infant with myotonic dystrophy. Bottle-feeding swallows of thin liquid were analyzed using videofluoroscopic swallow examination (VFSE) videos. The clinical features of swallowing included structural abnormalities, lip closure, sucking performance, aspiration and penetration, and bolus transition. The temporal characteristics were measured by the oral transit time, pharyngeal transit time, pharyngeal delay time, bolus appearance, and laryngeal vestibule closure. **Results** For clinical features of swallowing, the infant showed the weak control of tongue sucking, irregular rhythmic pattern of sucking, not properly tightened or closed lips, and silent aspiration and penetration. Results of temporal characteristics showed a longer duration time is required for temporal measurements of swallowing in cases of myotonic dystrophy. **Conclusion** We found that an infant with myotonic dystrophy suffers from swallowing difficulties. These difficulties can include poor sucking and lack of airway protection due to muscle weakness. Feeding and swallowing interventions are needed to aid in safe swallowing for an infant with myotonic dystrophy. It is critical to provide an adequate amount of nutrition and follow normal developmental milestones.

FEASIBILITY STUDY OF HYDROKINETIC AND PHOTOVOLTAIC SYSTEMS FOR A RESIDENTIAL BUILDING IN MOLINE, IL.

Group Leader

Wilcox, Alexander

Undergraduate, Technology

Group Member

Brett Emrich, Undergraduate, Technology

Mentor

Prof. Jin Jo

MidAmerican Energy Company is currently investing in enough wind capacity to generate 90% of their retail customers annual energy consumption, but their vision of sourcing 100% renewable energy will also require the installation of private power generation systems. This study investigates renewable energy technology options that can be viably installed at a residential river-front property in Moline, IL to offset one residential building's electrical energy consumption and to charge an electric vehicle. The outcomes of this study compare the cost and estimated annual power generations of installing a hydrokinetic turbine, a solar PV system, and the combination of these two systems.

MATERNAL MORTALITY RATES IN THE UNITED STATES

Group Leader	Williams, Ariel Undergraduate, Health Sciences
Group Members	Gabrielle Galusha, Undergraduate, Health Sciences
Mentor	Prof. Jacqueline Lanier
Authorship	Ariel Williams; Gabrielle Galusha

Maternal death or maternal mortality is defined by the World Health Organization as “death of a woman while pregnant or within 42 days of termination of pregnancy”. About 830 women die from pregnancy- or childbirth-related complications around the world every day. It was estimated that in 2015, roughly 303,000 women died during and following pregnancy/childbirth (Maternal Mortality, 2018). Majority of these deaths occurred in low resource settings, and most can be prevented. Other complications may exist before pregnancy but are worsened during pregnancy, especially if not managed as part of the women’s care. Major complications that account for nearly 75% of all maternal deaths are severe bleeding, sepsis, Preeclampsia/Eclampsia (high blood pressure), complications during delivery and abortions gone wrong. “Each year, an estimated 1200 women in the USA suffer complications during pregnancy or childbirth that prove fatal and 60,000 suffer complications that are near fatal- even though costs of maternity care in the USA in 2012 exceeded 60 billion United States dollars” (Maternal Mortality and Morbidity, 2015). The United States is one of, if not the most developed nation in the world. Yet, the US has the worst and highest rates of maternal mortality of the developed nations. Only half of the states in the US have maternal death review boards and of that data collected, it is not being utilized to guide changes that the possibility of reducing mortality and morbidity (Young, 2018). According to the CDC, 60 percent of maternal deaths are preventable (Martin, 2017). This study aimed to explore the secondary data surrounding this issue and complete qualitative interviews with experts in maternal mortality to better understand why these trends are occurring and what can be done in terms of prevention.