Student Presenter: Chandler Adamaitis

Booth Number: 1

Research Mentor: Sue Welch

Project Title: Fracking the Code on Flowback Fluid

Abstract: Hydraulic fracturing of shale generates brines with complex chemistries. As such, these fluids have trace metal constituents that can be rendered valuable if concentrated. This project used samples of hydraulic fracturing flowback fluid from the Utica/Point Pleasant shales in Ohio to analyze how different additives of acids and bases could influence precipitation and sequester trace metals. Flowback fluids were treated with sulfuric acid (H2SO4), phosphoric acid (H3PO4), hydrochloric acid (HCl), and sodium carbonate (Na2CO3), each in a high and low concentration. The fluids were allowed to react over several weeks and then the precipitates and the solutions were analyzed using scanning electron microscopy (SEM) and x-ray diffraction (XRD), and inductively coupled plasma optical emission spectrometry (ICP-OES) and inductively coupled plasma mass spectrometry (ICP-MS), respectively. Reacting hydraulic fracturing fluid with these acids and bases in different concentrations allowed for the precipitation of different minerals with variable elemental compositions. For example, low concentrations of H2SO4 resulted mainly in baryte (BaSO4) precipitation, while high H2SO4 resulted in precipitates of celestine (SrSO4) and gypsum(CaSO4 Â· 2H2O). Precipitating baryte (BaSO4) and celestine (SrSO4) can be beneficial for treating flowback fluids because the barium and strontium in those minerals can be easily substituted with radium, a radioactive element of concern found in flowback fluids. Additionally, akageneite ((Fe)^(3+) O(OH,Cl)) was found in the precipitates of the control sample and the high H3PO4 sample which will be helpful for further research as the mineral structure has large spaces that could allow for the scavenging of trace metals.

Student Presenter: Elizabeth Adams

Booth Number: 2

Research Mentor: Barbara Minkowitz

Project Title: Bone health protocal and compliance in children

Abstract: Purpose: Amidst concern over vitamin D (VitD) deficiency, this study was designed to evaluate compliance of children deemed deficient following fracture in previous study. The prior study found association between fracture severity and low VitD. All subjects were counseled regarding VitD supplementation at time of fracture using developed protocol, of which none were previously established. Effects of fracture severity, lower vitD, age on compliance evaluated. Methods: Patient's medical records, bone health and follow up surveys reviewed. Fractures categorized by Abbreviated Injury Scale. AIS 3, surgical fractures, had lowest vitD levels (24.6 ± 9.3 ng/mL) versus AIS 1(minor fx) and 2 (moderate fx) (30.0 ± 10.8 and 28.3 ± 8.4, respectively, P = 0.001). Patients were counseled regarding supplementation depending on vitD levels. Compliant and noncompliant patients' initial/follow up (2-3+ months) vitD levels were compared. Independent samples t tests, univariate and multivariable ordinal regression analyses performed to identify associations. Results: 369 fracture patients 2-18 years old from prior study. 163 were contacted using IRB approved survey. 71% of initial patients whose vitD was< 40ng/ml took supplement with 46% continued compliance at follow up. 37% stopped because they "forgot." Compliance in this group was not dependent on initial vitD level (p>.05), age, fracture severity. Improved follow-up VitD from initial was seen with protocol (p= .006). Conclusion: The protocol used for supplementation was effective with sustained compliance. Significance: The treating orthopedist can make a difference for patients. VitD levels ~30 ng/ml, were acceptable until prior study found 40ng/ml to be fragility fracture threshold (consistent with Endocrine Society). AAP recommends testing only those "at risk" which would not include most of these fracture patients. AAP should use vitD levels in adjusting supplementation per child rather than using one amount for "children".

Student Presenter: Alexandria Alpy

Booth Number: 3

Research Mentor: Donna Werling

Project Title: Neural Cells and Sexual Dimorphism

Abstract: A notable and unique characteristic of autism is the 4:1 sex bias. Males are diagnosed more frequently than females and there is no definitive answer to why that is. Hormones and the female "protective-effect" are common hypotheses to this extreme sex bias, but the scientific analysis lacks sufficient evidence to support these hypotheses. Additionally, several published papers brought to light specific neural cell-types, microglia, astrocytes, and endothelial cells, playing a role in the disruption of neural development and possessing different expression levels between the sexes. Through bioinformatics, we are able to use published microarray datasets to answer lurking questions that may provide sufficient evidence for further research and exploration. We first explored the role of sexual dimorphism within autism, testing whether genetic mutations from autistic patients disrupts genes associated with specific-neuronal cell-type expression. After a multiple-comparison correction, there was only one significant difference in the rate of mutations between autistic proband astrocyte marker genes and sibling astrocyte marker genes. We then investigated whether specific neural cell genes are differentially expressed between the sexes in mouse brain, without a focus on autism. After pre-processing, differential expression analysis, and annotation for neural cell types on published microarray data sets, we found that genes with higher expression in males had only a nominal significant overlap to microglial marker genes. These results encourage further research into genetic architecture of differentiation between male and female brains.

Student Presenter: George Andrei

Booth Number: 4

Research Mentor: Nicholas Breyfogle

Project Title: Nationality before Nationalism: Ethnic Politics, Geopolitics, and the Sustainability of the Magyar Kingdom in the East (1191-1400)

Abstract: The medieval kingdom of Hungary, founded by St. Stephan, was a patchwork of many ethnicities--Germans, Hungarians, Vlachs, Szekelys, and many others--sedentary and nomadic, Catholic and Orthodox. It was also situated on the very eastern border of Western Christendom; as such, its defense was of vital importance not solely to the local rulers, but for Rome as well. One group--itself multiethnic in nature--was made up of German colonists to southeastern Transylvania. First arriving in the middle of the XII century, the Saxons, as they are known collectively today, settled near several Vlach "countries": simple confederations of Vlach villages which held significant sway over their domains. The Vlachs, predecessors of modern Romanians, had presences in modern Romania and Serbia, and spoke Latin-based dialects. My research explores how the Vlachs and Saxons would later come to play vital roles in maintaining the Hungarian Kingdoms domains in the east. I argue that the Saxons were, from the beginning of their colonization, used as a tool by the Hungarian Crown and other authority figures in the region to expand, stabilize, and dominate the area: drawing in, after the Mongol invasions, desperately needed manpower, taxes, and support from the local populations. Reading a plethora of published sources by Hungarian, German, Romanian and other historians, both contemporary and more antiquated, as well as archived primary sources from the Romanian national archives, I will argue that the Hungarian authorities enabled the Saxons to flourish by granting specific privileges, which allowed the Hungarian kingdom to acquire land, peoples, and thus providing greater stability in the east. This research provides another view at the long history of ethnic and religious minority groups used by authorities to fill certain societal roles, one from an area often overlooked by Western historians.

Student Presenter: Yerdanos Asmelash

Booth Number: 5

Research Mentor: Shaneice Mitchell

Project Title: NAMPT inhibitor KPT-9274 as a treatment for Acute Myeloid Leukemia

Abstract: Acute Myeloid Leukemia (AML) is a cancer characterized by abnormal cell growth of immature myeloid cells. Currently, AML is only curable in about 35 to 40% of adult patients who are 60 years or younger, and less favorable in patients who are 60 years or older where rates are 5 to 15%. In addition, most patients have multiple malignant clones of leukemic stem cells, each differing in their responses to treatment. However, studies have shown that inhibition of the enzyme nicotinamide phosphoribosyltransferase (NAMPT) is a possible avenue for treatment of AML. NAMPT is responsible for the production of NAD+, a key metabolite needed for various cellular functions. By inhibiting NAMPT, NAD+ production is expected to decrease, thus resulting in cell death. The purpose of this study is to evaluate the ability of KPT-9274, a novel NAMPT inhibitor, to eradicate leukemic colonies in AML. To access the ability of KPT-9274 to decrease colony formation, three AML leukemic patient cells were treated with KPT-9274. Cells were plated and incubated on a 6-well cell culture plate, along with a control group in a semi-solid medium. After two weeks, leukemic cell colonies were counted using an inverted light microscope. The cells were washed with 20% RPMI media, underwent a dilution process to achieve a desired amount of cells, and then re-plated to access self-renewal capacity. Colony formation decreased in the three AML leukemic patient cells by 39.7 to 75.9%. These results are consistent with previous findings that support the drug's potential to decrease NAD+ production, leading to decrease in colony formation. Self-renewal capacity of the three patients is currently being accessed. Overall, this study provides evidence that the NAMPT inhibitor, KPT-9274, is able to eradicate malignant clones found in AML patients that may lead to patient relapse.

Student Presenter: Elizabeth Auckley

Booth Number: 6

Research Mentor: James Cowan

Project Title: Understanding the Role of Dre2 in Cellular Iron-Sulfur Cluster Trafficking

Abstract: Iron-sulfur (Fe-S) clusters are essential for cellular life and are required in all parts of the cell. In eukaryotes, the export of Fe-S clusters from the mitochondria to other parts of the cell is an important and currently ill-understood process. This project studies the role of Dre2, an Fe-S cluster protein, as a proposed part of the Fe-S cluster assembly machinery that transports Fe-S clusters out of the mitochondria. Dre2 has previously been shown to hold two clusters—a 4Fe-4S cluster and a 2Fe-2S cluster. In this study, UV-Vis and circular dichroism (CD) have shown Dre2 to take up a 4Fe-4S cluster through chemical reconstitution and release Fe-S clusters in glutathione extractions, supporting their potential to transport clusters. Incubation of Dre2 with the scaffold protein Isu was monitored by circular dichroism (CD) and demonstrated to transfer Fe-S cluster from Isu to Dre2. Incubation of reconstituted Dre2 with Nfu also demonstrated transfer of a second cluster, likely a 2Fe-2S cluster, to Dre2. Dre2 was also reconstituted following incubation with Atm1p, a proposed mitochondrial Fe-S exporter, and a glutathione-coordinated Fe-S cluster. Transfer chemistry was again monitored by CD, showing that Atm1p may facilitate uptake of a second, likely 2Fe-2S, cluster to Dre2. Additional incubations with holo yeast Nfu, Grx3, and Isu are currently under study to elucidate the mechanism of 2Fe-2S and 4Fe-4S cluster transfer to Dre2. This preliminary data suggests Dre2 to play an important role in cellular Fe-S cluster assembly, potentially linking mitochondrial and cytosolic assembly pathways. If this transport role is confirmed, Dre2 could be further studied for links to human disease. Since Dre2 has been implicated in neurodegenerative conditions, there may be a previously unidentified link between cluster transport and diseases such as Alzheimer's and Parkinson's.

Student Presenter: Alison Baker

Booth Number: 7

Research Mentor: Allison Ellawadi

Project Title: Case of the Missing Shape Bias: Visual Memory & Object Engagement in Children With Autism

Abstract: Many young children with autism demonstrate delays their in receptive and expressive language skills (American Psychological Association, 2013). This delay in vocabulary development is due, in part, to their failure to develop the shape bias, a word learning strategy used by typically-developing (TD) children (Tek et al., 2008). The shape bias is the tendency for children to extend labels for solid count objects on the basis of shape rather than other attributes, such as size or color (Diesendruck & Bloom, 2003). This study seeks to determine if the observed delay in the formation of the shape bias can be attributed to impairments in visual memory or atypical object engagement. For example, many children with autism demonstrate atypical object engagement such as by fixating on one aspect of an object (e.g. spinning the wheels of a car) and disregarding all other features of the object (Baranek, 1999). Similarly, previous research indicates that children with autism fare poorer than their TD peers on facial recognition tasks which require strong visual memory skills (Shic, Chawarska, Bradshaw, & Scassellati, 2008 & Chawarska, Katarzyna & Shic, Frederick, 2009). Preliminary data for this study has yielded variable results. In some children (n=2), high amount object engagement was correlated with the presence of the shape bias regardless of visual memory skills. However, in other children (n=3) who did not display visual memory skills, the shape bias was not observed even with moderate amounts object engagement. These conflicting results may be attributed to individual differences and the small coded sample size. To date, 16 children have completed the study (autism N=5, TD N=11) and are in the process of being coded.

Student Presenter: Alivia Ball

Booth Number: 8

Research Mentor: Eric Bielefeld

Project Title: Re-assessing hearing loss after simulated gunfire noise

Abstract: Noise exposure can be classified into three primary categories: continuous, a persistent noise that fluctuates little over time, impact noise, a short duration sound that results from the collision of two objects, or an impulse noise, which is the result of an explosion of large or small scale. Each can result in damage to the cochlea that could be either permanent or temporary, depending on the duration and intensity of the exposure. Recreational and occupational firearm use is often accompanied by use of hearing protection that reduces the level of impulse noise reaching the cochlea. Those short duration signals are often between 110 and 125 dB pSPL . However, those levels are unlikely to cause significant threshold shift. Therefore, the shooter is believed to be sustaining no injury to the auditory system. But there have been no investigations into whether prolonged exposure of several minutes of this mild impulse noise can lead to deafferentation of the inner hair cells (IHC) resulting in a "hidden hearing loss" that cannot be detected when measuring thresholds. By simulating the chosen impulse noise of a gun shot with hearing protection and exposing chinchillas to that impulse noise, we could examine the long-term effects on the nerve fibers of the IHCs. The chinchillas were exposed two times to a 115 dB pSPL noise and were examined at Days 0, 7, 14 and 21 following each exposure to track and threshold or amplitude shifts and once at Week 16 to examine any long-term effects. After examining the chinchillas, we noticed temporary threshold shifts and sustained amplitude shifts. It is believed that the exposures to this impulse noise may have resulted in the anticipated deaffrentation of the IHC. The potential loss of IHC auditory nerve neuron synapses will be more evident in post-mortem histopathology.

Student Presenter: Hannah Barker

Booth Number: 9

Research Mentor: Sameek Roychowdhury

Project Title: Characterization of the Novel KLK2-FGFR2 Fusion in Prostate Cancer

Abstract: Objectives of the Study. The fibroblast growth factor (FGFR) family is a critical aspect of essential cellular processes. Deregulation of the FGFR family members through mutations, fusions or copy number variations can alter homeostasis in several ways, often leading to mutant driven cancer. A prostate cancer patient seen in Dr. Roychowdhury's clinic was found to have a novel KLK2-FGFR2 gene fusion by an in-house next generation sequencing assay (NGS). The mechanisms of how this fusion is driving prostate cancer are unknown. Methods. To characterize the fusion, we generated two stable NIH3T3 cell lines- one with the vector alone (Empty) and one with KLK2-FGFR2 activating fusion. These two cell lines were used for in vitro studies. Evaluation of sensitivity to several FGFR inhibitors was conducted by treatment of both cell lines with increasing doses of BGJ398, Ponatinib, Dovitinib, and AZD4547. Cell viability was assessed after 72 hours using MTS assay. Protein expression was analyzed by western blot analysis. Lastly, cell migration was investigated via a transwell migration assay. Results and Conclusions. Drug sensitivity assays revealed that NIH3T3 KLK2-FGFR2 cells were sensitive to all four FGFR inhibitors used. Of all four, NIH3T3 KLK2-FGFR cells proved most sensitive to Ponatinib. Western blot analysis revealed upregulation of phosphorylated AKT, MEK, and PI3K. This suggests a mechanism of improper regulation of the mTOR pathway. The migration assays showed NIH3T3 KLK2-FGFR2 cells increased migration activity in comparison to the NIH3T3 Empty cells, giving insight to the activity in the cancer cells. Significance. Research thus far has given insight to the mechanisms in which the gene fusion between KLK2 and FGFR drove this patient's prostate cancer. Further investigation will lead to greater understanding and characterization of the novel fusion, which has the potential to be clinically significant.

Student Presenter: Julia Berry

Booth Number: 10

Research Mentor: Noel Paul

Project Title: Functionalized ortho-Carborane as a Metal Ion Chelator

Abstract: Modern medicine frequently relies on magnetic resonance imaging (MRI), and the administration of chelated metal ions as contrast agents is often required to obtain sharp images. However, inevitable deposition of the toxic metal into the body imparts a low level of toxicity. Carboranes, which can possess the ability to bind metal ions, are of interest for their potential application in improvement of current macrocyclic contrast agents. The goal of this study is to develop a stable, carborane-based macrocycle with the capacity to chelate gadolinium ions and be developed into a viable MRI contrast agent. Initial work explored the cyclization of bis(butenyl)carborane via olefin metathesis, but the products exhibited especially low solubility, greatly complicating their purification and further analysis. Thus, new studies that explore the feasibility of hydroxy-substituted carborane macrocycles in this hypothesis have been conducted. The reactivity of the ortho-carborane dianion has been examined in nucleophilic addition to various carbonyl compounds according to literature guidelines, and the products of these reactions were characterized using 1H and 13C NMR. These methods have been considered as a means to introduce hydroxyl groups that may be used to coordinate gadolinium ions or serve as a handle to allow for cyclization. Mass spectrometry and 11B NMR methods are being explored to aid in characterization of the resulting products. Successful development of strong chelating agents would have a significant impact on medical imaging by minimizing deposition of the toxic metal into the body, thereby reducing the risk associated with current contrast agents.

Student Presenter: Perry Blough

Booth Number: 11

Research Mentor: Giancarlo Valiente

Project Title: Topically Administered Imiquimod Induces Systemic Autoimmunity in Wild-Type Mice: Examining its Effects on Cutaneous Lymphocytes

Abstract: Imiquimod, a TLR7 agonist, has been shown to yield a phenotype in mice that resembles Systemic Lupus Erythematosus (SLE) in humans. When applied topically, Imiquimod induces an autoreactive state that yields lupus-like manifestations such as autoantibodies, cutaneous lesions, glomerulonephritis, and splenomegaly. However, the role of lymphocytes, particularly in the skin of these murine models, is not well understood. The aim of my project is to establish a murine model exhibiting lupus-like manifestations in order to explore the function of particular lymphocytes in the skin of these mice. Mice will be topically treated with Imiquimod on their dorsum every three days over the course of four weeks while control mice will be treated with a vehicle control in the same manner. Weights will be recorded each week, and blood and urine samples collected weekly will be analyzed using an autoantibody ELISA, Urine Albumin ELISA, and BUN assay. At the conclusion of the study, all mice will be sacrificed and various tissues will be harvested for histopathologic assessment. If the Imiquimod-treated mice exhibit lupus-like manifestations, the same experiment will be repeated on other strains of mice, including BALB/c and B6. Sle1 in order to determine if the manifestations are strain-dependent. After establishing a successful murine model of SLE that manifests cutaneous lesions, future experiments will be conducted to isolate lymphocytes from lesional, non-lesional, and healthy skin samples to study differences in quantity, function, and migration patterns of these cells. By better understanding the role of lymphocytes in lupus-like disease, these findings can be translated into medically impactful treatments and therapies for individuals suffering from SLE or other autoimmune diseases.

Student Presenter: Jack Bradley

Booth Number: 12

Research Mentor: D. Rose Elder

Project Title: Socioeconomic and Cultural Implications of the Introduction of Composting Toilets for Improved Sanitation in Rural Ghana

Abstract: Ghana, home to approximately 27 million people, is located in West Africa and is one of the most chronically impoverished regions of the world. Over 85% of the total population lacks access to improved sanitation, creating great risk for infection and disease. The intent of this research was to explore and understand a multitude of socioeconomic and cultural issues related to sanitation practices in rural Ghana. To investigate these issues, a composting toilet system was designed and constructed in partnership with study participants using locally available resources. Working closely with study participants made construction of the system more economically feasible and approachable. The hands-on collaboration with study participants was successful, allowing for smooth implementation and retention of the technology. This exciting trial is a promising beginning towards improving sanitation in rural areas of West Africa and the rest of the world. In an attempt to further educate and spread similar technologies, the potential for project-based learning (PBL) lesson plans on improved sanitation are being investigated. The impact of this first trial is small, but the potential for adoption of simple but life changing adaptations is apparent. An overwhelming desire for better sanitation infrastructure is present in this region of the world. Furthered education, rather through hands on demonstrations or PBL in classrooms, is the next step towards improving the lives of millions.

Student Presenter: Ally Brady

Booth Number: 13

Research Mentor: Mike Wilkins

Project Title: Microbial growth in hydraulically-fractured deep shales: implications and prevention

Abstract: Over the past decade, hydraulic fracturing has become an increasingly popular form of hydrocarbon recovery in the United States, and is currently responsible for approximately two-thirds of U.S. natural gas production. With over 300,000 wells drilled, it is important to understand how biogeochemical processes in these systems may affect corrosion, bio-clogging, and the more efficient recovery of oil and gas. The bacterial genus Orenia has been found to dominate microbial communities in fractured wells, representing up to 75% of the community after 250 days. This organism can potentially produce well-clogging biofilms (leading to reduced yields), and corrosive sulfides and organic acids, making Orenia harmful if ignored. Understanding optimal growth conditions necessary for development of Orenia is the first step in preventing microbial proliferation. Once the growth mechanisms and patterns are understood, specific chemicals can be used to target these microorganisms. By utilizing biocides, chemical compounds formulated to inhibit biological life, well operators can slow or halt the growth of Orenia and other microbial species, leading to cleaner, safer, and more productive wells. Here, both the growth cycle of Orenia and its potential for to generate sulfide was investigated, and compared to that of another prevalent microbe in the community, Halanaerobium. We also examined how different electrophilic biocides affect the growth of Orenia at atmospheric pressure, providing a better understanding of how to inhibit bacterial growth. Orenia proved to have a short and vigorous life cycle and reacted differently to three general biocides. The high sulfide production of Orenia is an indicator of the potential well damage inflicted by the microbe. Through this investigation, we aimed to save resources by limiting the amount of biocide used and to ensure hydraulically fractured wells are not victim to microbial activity which may clog or corrode them, leading to a safer, cleaner energy-harvesting process.

Student Presenter: Natalie Brooks

Booth Number: 14

Research Mentor: Thomas McDow

Project Title: The Impact of HIV Test Counselors in Iringa, Tanzania

Abstract: Quality care is necessary for those living with HIV/AIDS and also for people who are at risk for contracting the virus. HIV counseling and testing (HCT) is the key to proper intervention for HIV/AIDS in communities heavily impacted by the virus. Through counseling and testing offered to the public, HCT strategies can identify infected individuals, raise awareness and expand education to reduce HIV transmission. However, there is a gap between the older and younger population when utilizing resources that allow them to receive HCT services. Here we show that this leaves the older population more at risk for becoming infected with HIV in Iringa, Tanzania. Based on 50 closed-ended question surveys, 80% of the participants ages 18-30 have been tested for HIV before. Interviews with several informants suggests that majority of clients seeking HIV testing and barriers for sexual activities are young adults and adolescents. Many older people in the community did not feel comfortable participating in the study however, several young students in the area were willing to answer the questions and provide information about their sexual behaviors. HIV test counselors that were interviews also explained that older people avoid the conversation of sex and would rather not know than find out. These findings demonstrate an increase in effectiveness in young adult but are not getting older generations to seek testing and sexual health resources. Though the HIV prevalence is higher for ages 30-49, efforts of test counselors have switched their efforts to the younger population because 75% of new infections are in young women and adolescence in Sub-Saharan Africa. HCT techniques changed over time by introducing sex education in programs, door-to-door testing and couples testing in order to reach out to the younger population.

Student Presenter: Sarah Burens

Booth Number: 15

Research Mentor: Ashleigh Maxcey

Project Title: Examining the context account of access-based forgetting

Abstract: Negative consequences of accessing information in long-term memory include forgetting related information. Here we report two novel tests of the context account of access-based forgetting. This forgetting effect is demonstrated when groups of objects are studied (in the study phase), then a subset of the objects are remembered (in the practice phase), and finally memory for all the objects is tested (in the test phase). In this paradigm, non-practiced items that belong to practiced categories (i.e., related objects) are remembered at lower rates than all other objects, hence the term access-based forgetting. The context account posits that forgetting occurs because when confronted with an object during the test phase, if the object belongs to a practice category (e.g., vases, chairs) the practice context is accessed because that was the most temporally recent context in which this category was encountered. However related objects are not there because although they belonged to a practiced category, they were not practiced. This error in accessing the practice context leads to poor memory for those related objects. To test this account, in Experiment 1 we measured memory for secondary objects inserted into both the study and practice phases and in Experiment 2 we manipulated the background color at test, to reinstate either the study phase or the practice phase. In Experiment 1, secondary objects presented in the study phase were better remembered than memory for secondary objects presented during the practice phase. In Experiment 2, the same forgetting was observed whether the study or practice phase was enduringly active at test. These results are contrary to predictions made by the context account, challenging the context account, and providing novel findings for theoretical explanations of forgetting as we encounter, and reencounter, objects in our world.

Student Presenter: Bethany Cady

Booth Number: 16

Research Mentor: Paul Healy

Project Title: Behavioral Preferences in Children

Abstract: Experimental economics as a discipline generally lacks subject diversity, skewing our understanding of preferences and decision-making for the general population. Furthermore, little work has been done regarding the relationship between household income and behavioral preferences in this subject base. This unique perspective highlights how household dynamics and income affect behavioral preferences and furthers our insight in the development of such preferences. This study contains both survey and experimental elements. The survey portion serves to indicate how subjects fall on scales of socioeconomic status derived from various factors. The experimental portion consists of three activities of which the results suggest risk preferences and altruistic behavior: a risk-distribution game, a classic Prisoner's Dilemma, and a binary-choice dictator game. In each experiment, the subjects earned game tickets based on their performance and decisions that could be redeemed for toy prizes at the end of the study.The results of this study reveal multiple relationships. Through simple regression, we compared the relationship between the subjects' decisions and their household income, race, number of siblings, age rank among siblings and highest parental education. In our risk-distribution experiment, we found that white subjects and those with fewer siblings make risk-averse allocations. The results of our Prisoner's Dilemma game suggest higher parental education correlates with the intent of higher payoff, but has a negative correlation with valuing honesty. The binary-choice dictator game reveals that children with higher household income make altruistic choices, regardless of self-cost or inequity. These results suggest an important role of socioeconomic status in the development of behavioral preferences. This understanding can be applied in various capacities. Comparisons of such preference trends between different age groups could help predict a child's future economic involvement. This includes the investment behavior, career choice, and pursuit of higher education.

Student Presenter: Grace Calhoun

Booth Number: 17

Research Mentor: Debbie Guatelli-Steinberg

Project Title: Quantifying the Sexual Dimorphism in the Geometry of Modern Human Canines

Abstract: Ward et al. 2010 describe shape changes in the evolution of hominin canine teeth. Over time and across species, canine teeth evolve from a form with a more acute angle at the canine tip (the ancestral form) to one which is less acute, and thus more rounded. This change is thought to be an adaptation to diet, with canine teeth evolving to function more like incisors, much like those of modern humans. This project aimed to determine whether this same difference in shape can be seen between the canines of modern human males and females. The canine tooth is the most sexually dimorphic tooth type in terms of size, but few studies have focused on sex differences in its shape. This project specifically asks whether or not males have a more pointed canine shape and females a more rounded form. If the data support the hypothesis, this sex difference in canine shape could provide a new tool for sex identification of human remains in the fields of bioarchaeology and forensics. We measured 200 canine teeth from dental casts made in the 1960's of Gullah individuals, for a study of their health and biology. The casts were divided evenly between the upper right, upper left, lower right, and lower left, with 50% males and 50% females per tooth type. We used the law of cosines to calculate the angle at the apex of each of these teeth, which served as an indication of pointedness. We found a statistically significant difference between males and females, showing that on average, females indeed have slightly more rounded canines (by about ten degrees) in all four tooth types. We are in the process of gathering more data from different human populations to assess if this sex difference pertains to more than one population of humans.

Student Presenter: Anna Callahan

Booth Number: 18

Research Mentor: Tania Oberyszyn

Project Title: Insight into why skin cancer patients are at an increased risk of developing internal cancers.

Abstract: Development of Basal and Squamous Cell Carcinomas, part of the Keratinocyte Carcinoma (KC) group, is associated with ultraviolet light B (UVB) exposure, a known complete carcinogen. Recent evidence has shown that patients with KCs are up to 130% more likely to develop other primary cancers, such as colon cancer. Likewise, many patients with developing intestinal issues tend to first notice symptoms on the skin, suggesting a relationship between the two tissues. However, It is not clear if the internal malignancy precedes the KC or vice versa. Our lab conducted a preliminary study to determine if cutaneous UVB-induced skin cancer development could alter the course of chemically induced colon carcinogenesis. SKH-1 mice were divided into four groups: 1) PBS + water/no UVB, 2) PBS + water/UVB 3), azoxymethane (AOM) + dextran sodium sulfate (DSS)/no UVB, 4) or AOM + DSS/UVB. At the conclusion of the study mice in the AOM+DSS/UVB group had the highest incidence of colon tumors, suggesting that internal malignancies could be exacerbated by cutaneous UVB-mediated skin carcinogenesis. We hypothesized that UVB exposure could alter the colon microenvironment leading to the observed increased colon tumor incidence. In fact, the combination of AOM+DSS and UVB exposure was associated with increased inflammation and immune cell infiltration into the colon, as well as alterations in the make-up of the colonic microbiota compared to control mice. Likewise, differences in relative cytokine levels were seen between the four treatment groups. These data suggest that cutaneous UVB exposure not only induces skin carcinogenesis but can also enhance AOM+DSS-induced colon cancer by changing the colon microenvironment. Further study is warranted to examine the mechanism by which UVB-mediated skin tumor development affects the colon and if the development of skin cancer could be an indicator of internal malignancy.

Student Presenter: Mary Carson

Booth Number: 19

Research Mentor: Barbara Andersen

Project Title: Improving the Effectiveness of an Online Intervention for Major Depressive Disorder in Cancer Patients.

Abstract: Introduction: Major depressive disorder (MDD) is the most prevalent psychiatric disorder among cancer patients and is associated with significant functional impairment including poorer quality of life and physical health. There are no specific treatments for cancer patients with MDD and only a handful of studies have successfully adapted cognitive behavioral therapy (CBT) for the cancer population. Traditional face-to-face CBT may not be ideal for patients with cancer, as patients are already burdened by numerous appointments, fatigue, and/or negative associations with clinical settings. A convenient, more accessible treatment such as computerized cognitive behavioral therapy (cCBT) may be a suitable alternative. However, there have been no studies evaluating the level of "support" needed to optimize treatment outcomes of cCBT. "Support" refers to different interaction levels between cCBT coaches and participants. The proposed study will examine the influence of "support" provided by cCBT coaches and the influence of treatment adherence on therapeutic outcomes. Methodology: For this randomized waitlist control trial, growth curve modeling will examine the relationship between support, treatment adherence, and treatment outcomes for this 8 week cCBT. The study requires 66 individuals with a current/prior cancer diagnosis and a diagnosis of MDD. Primary outcomes and secondary outcomes are improvements in depression and improvements in anxiety and cancer related stress, respectively. Results: We expect that: (1) as the level of support increases, depression severity will decrease; (2) as the level of treatment adherence increases, depression severity will decrease; (3) increased support will lead to increased treatment adherence, and that this relationship will fully or in part account for increased treatment outcomes. Significance: Online interventions may be an ideal treatment modality for cancer patients. Understanding what level of "support" is most effective for cCBT is crucial for achieving therapeutic effects and will help to optimize online treatments for cancer patients.

Student Presenter: Alexandria Carter

Booth Number: 20

Research Mentor: Thomas McDow

Project Title: Understanding the Perspective of Tanzanian University Students on Health Insurance

Abstract: Following the liberalization of Tanzania's socialist economy in the 1980s, a competitive medical market replaced free healthcare. Health insurance was first introduced in Tanzania in 1996, and a new law required university students to have health insurance starting in 2016. Anthropological studies have shown that older generations disapprove of a health system with unequal access while younger generations believe a competitive market ensures better quality medical care. Students view about health insurance, especially in light of the new requirement, have been largely unexplored. This study aims to illuminate student experiences with health insurance, their views on healthcare affordability, and their trust in acquiring treatment with health insurance. During four weeks of in-country research, data was obtained from eight students and three key-informants at Ruaha Catholic University in Iringa, Tanzania using semi-structured interviews. All students expressed a positive view of health insurance specifically citing their ability to receive medical care without paying out-of-pocket. Many students noted, however, that cash-paying patients in local hospitals were given priority over those with health insurance, even in life-threatening situations. Many students reported that everyone can purchase health insurance, but informants recognized the need for state involvement in healthcare to reduce insurance costs and educate people on the advantages of health insurance. These sentiments demonstrate that while students supported free market health insurance, they still held concerns regarding equal access to health insurance. This study reveals that in light of the new requirement for Tanzanian university students, students' value health insurance and the quality of care it provides, but health insurance users still faces many obstacles to medical care. By addressing corruption and local attitudes towards insurance, better health care policies can be made to increase Tanzanian's access to healthcare and improve health outcomes across the nation.

Student Presenter: Cynthia Chen

Booth Number: 21

Research Mentor: Agusti Munoz-Garcia

Project Title: Resting metabolic rate in relation with muscle maturation in Japanese quail selected for differing rates of growth

Abstract: Life History Theory posits that the timing and duration of important life events are molded by natural selection to maximize reproductive output. However, the linkages between life history and physiological mechanisms that determine these traits are poorly understood. In this study,we wanted to determine the relationship between skeletal muscle maturation, growth rate, and energy expenditure. We used two lines of Japanese quail (Coturnix coturnix japonica):fast-growth (FG) line, selected for over 70 generations; and a random-bred control (RBC). Both lines reach adult size after 48 days of development; however, FG quail have a significantly larger adult body mass than the RBC quails. We wanted to measure the following variables: transitions of different myosin isoforms as a proxy to estimate the degree of skeletal muscle maturation;energy expenditure of individuals,using open-flow respirometry; and dry organ mass, in individuals from both lines at days 0, 24 and 48(when they reach adulthood). We also will measure body mass every day to estimate growth rate of birds. As expected, body size was larger in FG hatchlings (day 0) than in RBC hatchlings. We found that RBC hatchlings had a significantly higher mass-specific resting metabolic rate (RMR) than FG hatchlings. We also found that in hatchlings from both lines, relative brain size,and relative digestive tube size showed a positive correlation with RMR, whereas relative pectoral muscle size showed a significant negative correlation with RMR. Currently, we are collecting data from 24-day old chicks and 48-day old adults, and we are developing a protocol to identify myosin isoform transitions in birds of both lines from all ages.

Student Presenter: Kristen Dammeyer

Booth Number: 22

Research Mentor: Brenda Lilly

Project Title: Cytoglobin Expression Is Induced in Vascular Smooth Muscle Cells Through Endothelial Cell- Derived Notch Signaling: Implications of A Protective Role in Blood Vessel Function

Abstract: Communication between endothelial cells and smooth muscle cells is required for normal blood vessel formation and function. My research focuses on understanding the molecular signaling pathways that govern cell-cell communication and maintain vascular function. The Notch signaling pathway is an established mediator in cell-cell communication. Notch signaling is activated in smooth muscle cells by adjacent endothelial cells and induces gene expression profiles that determine smooth muscle cell function. In this study, I identified Cytoglobin as a gene that is induced in smooth muscle cells by co-cultured endothelial cells. Cytoglobin is a hexa-coordinate hemoglobin that has been implicated in stress regulation through its modulation of nitric oxide and reactive oxygen species. My data demonstrate that Cytoglobin is induced in smooth muscle cells via the Notch signaling pathway and that smooth-muscle expressed Notch receptors are both necessary and sufficient for Cytoglobin expression. Cytoglobin induction by endothelial-derived Notch signaling is altered when smooth muscle cells are cultured with nitric oxide modulators, hypoxia mimics, and reactive oxygen species. This alteration hints at Cytoglobin's potential role in modulating redox stress. My findings thus far support the notion that endothelial cells induce Cytoglobin expression in smooth muscle cells as a means to regulate nitric oxide bioavailability in blood vessels. Further examination of Notch signaling and Cytoglobin expression in dysfunctional vessels may reveal novel targets for therapeutic intervention of vascular-associated diseases.

Student Presenter: Aaron D'Amore

Booth Number: 23

Research Mentor: Bill Peterman

Project Title: Evaluating the quality of DNA extracted from blood and cloacal swabs of endangered rattlesnakes (Timber Rattlesnake, Crotalus Horridus) using Chelex 100 as a medium.

Abstract: The timber rattlesnake (Crotalus Horridus) is an endangered species in Ohio. Its range has dramatically declined since European settlement. Today the species is continuously under threat from climate change, disease, and lose of genetic diversity associated with habitat lose and declining population sizes. It is common for researchers to use blood extractions as a way of retrieving reliable, high-quality DNA from endangered, potentially harmful organisms such as the timber rattlesnake. However, these phlebotomies can often times be invasive and harmful to these already dwindling organisms. Since, their broods are small and they only reproduce once every 3-4 years, even killing just one organism could impact the size and genetic diversity of the population. To maintain the health of each individual and the overall genetic diversity of the species, it is extremely critical to obtain DNA in the simplest and least invasive manner possible. Cloacal swabs have been used in the past as a way of attaining reliable DNA from tortoises while causing little to no harm to the organism. We tested this method on fourteen timber rattlesnakes from a population in Southeast Ohio. DNA was extracted from paired cloacal and blood swabs from each individual using Chelex 100 as a medium. We then compared the concentration and quality of the DNA in each sample using a NanoDrop 2000c. Results indicate that the concentration of DNA produced by blood and cloacal DNA extractions was not significantly different, however, the quality of DNA for the blood swabs was significantly higher (p-value <0.001). Further research implementing PCR will show if the DNA quality of cloacal swabs is sufficient for use amplifying species-specific microsatellite markers for future population genetic studies.

Student Presenter: Brian Diep

Booth Number: 24

Research Mentor: Nicholas Brunelli

Project Title: Analyzing organosilane leaching using a continuous packed bed reactor

Abstract: As the global demand for industrial and consumer products has increased in recent years, so too has the need for robust and high-performance catalysts to support this demand. In particular, heterogeneous catalysts have proven to be versatile and economically feasible options to this problem. However, one issue that these catalysts encounter is catalyst deactivation, where the active sites on the catalyst support are degraded or leached over time as a reaction proceeds. Organosilane catalysts have been studied for their ability to catalyze reactions that convert abundant biomolecular feedstocks such as cellulose and glucose to more valuable products used in the polymer, green energy and fine chemical industries, such as HMF. Our work focuses on studying the leaching of organosilane groups from SBA-15, a mesoporous silica support, by using a continuous packed bed reactor. We theorize that organosilane species leaching can be observed by monitoring the activity of a reaction such as the glucose to fructose isomerization over time, and can give insight into the mechanism of deactivation in the catalyst. Additionally, varying the organosilane loading and type will help to understand how those two factors affect catalyst performance and active site retention. Another benefit for using a continuous reactor such as a packed bed reactor is that it simulates how the catalyst can perform in industrial settings, where continuous processes are the norm rather than batch processes that are used in the laboratory. This data can be used in the future to further understand the leaching/deactivation process and create more robust catalysts that will be able to stay active for longer periods.

Student Presenter: Tarshangi Dixit

Booth Number: 25

Research Mentor: Monique Pairis-Garcia

Project Title: Validation of scan sampling techniques for behavioral observations of broiler chickens

Abstract: Behavioral evaluation is an effective means to objectively assess individual animal welfare. However, behavioral evaluation can be time consuming and impractical for studies utilizing a large number of animals. Therefore, identifying alternatives to the continuous sampling methodology that minimizes labor while maintaining accuracy is critical. This is particularly important in studies assessing the behavior and welfare of broiler chickens given the scale of standard commercial facilities. The objective of this study was to validate the accuracy of five different instantaneous scan sampling intervals (5 minute, 10 minute, 15 minute, 20 minute, 30 minute) when compared to 1-minute instantaneous scan sampling intervals for broiler chickens (Ross 708) housed in enriched pens (n=2; straw bales) and non-enriched pens (n=2). Video was recorded continuously over a two day period (12 hours/day). Behavioral data was collected using 1-minute instantaneous scan samples for the following behaviors: sitting/lying, standing, feeding, drinking, preening, and bale interaction. Data from one minute instantaneous scan sampling were statistically compared to the other sampling intervals using a linear mixed model. The percentage of time all behaviors (sitting/lying, standing, feeding, drinking, preening, and bale interaction) did not differ amongst the sampling intervals. The results from this study suggest that 30-minute instantaneous scan sampling interval can accurately estimate broiler behavior in both an enriched and non-enriched pen.

Student Presenter: Brad Eichar

Booth Number: 26

Research Mentor: John Gunn

Project Title: Identification and Characterization of Small Molecules with Inhibitory Properties towards Salmonella enterica Biofilms

Abstract: Salmonella enterica serovar Typhi (S. Typhi) is a human-specific pathogen and the primary causative agent of typhoid fever. S. Typhi infections are responsible for an estimated 21 million new infections each year, resulting in 200,000 deaths. This bacterium persists chronically in the gallbladder of 3-5% of individuals after resolution of acute infection. This chronic carrier state is mediated by S. Typhi biofilms – organized communities of microorganisms that adhere to surfaces resulting in recalcitrance to antibiotics and immune components – on the surface of gallstones. Inhibition of biofilms in carriers could help curb the spread of typhoid fever. This study utilized a high throughput screen of a 4,000 compound ChemBridge™ library for in vitro anti-biofilm activity against Salmonella (S. Typhimurium was used in this assay). This screen initially identified 226 compounds that demonstrated anti-biofilm activity at a threshold of ≥30%. Compounds that were identified initially were rescreened three additional times, and compounds that maintained the ≥30% inhibition threshold were further characterized. We have identified a lead compound, JG1, capable of reducing biofilm formation by 51.07% at 10 μM. The compound was not bactericidal or bacteriostatic towards S. Typhimurium, while its toxicity against mammalian cells is being tested. A delayed drug addition assay demonstrated that JG1 has a greater impact when added during the early stages of biofilm formation, suggesting an inhibition of bacterial surface binding. The compound's half maximal effective concentration (EC50) should be ~10 μM, but is currently being precisely determined. Overall, the identification of a lead compound with the ability to inhibit a Salmonella biofilm is a promising step towards eradication of the Salmonella chronic carriage state.

Student Presenter: Farida Eid

Booth Number: 27

Research Mentor: Chen Gu

Project Title: Distinctive Myelin Alterations in the Brain Regions Involved in Emotion and Rationality in Two Mouse Models for Multiple Sclerosis

Abstract: Multiple Sclerosis (MS), an inflammatory demyelinating disease of the central nervous system, is characterized by axonal demyelination and degeneration. Without myelin, proper conduction of nerve impulses is disrupted, leading to sensory and motor function deficits, as well as significant impairment in cognition and emotional processing. Many of the brain regions responsible for these higher brain functions have significant amounts of grey matter (GM) tissue. GM consists mainly of cell bodies and dendrites, with some myelinated axons. Previous research into MS has primarily focused on densely myelinated tissue, white matter. Studies of GM demyelination and recovery are important, as it is predicted to play an important role in MS long term cognitive impairment. Two mouse models widely used to study MS are the cuprizone model and experimental autoimmune encephalomyelitis (EAE). The cuprizone model shows toxic-induced demyelination, while the EAE model involves autoimmmune targeting to induce demyelination. The effects of these models in GM, if well understood, could be important in better understanding the mechanism underlying demyelination in GM. Here we report that demyelination in the cuprizone and EAE mice is remarkably different in the GM of the amygdala and cerebral cortex, two brain regions important in emotional and rational regulation, respectively. While there was significant clustered GM demyelination in these regions in cuprizone-fed mice, no change was seen in EAE mice. We also found differential alterations of glial cells, which maintain homeostasis in the central nervous, between the two models. In addition, the cuprizone model showed that toxin-mediated GM demyelination was independent of Kv2.1 K+ channel localization in the somatosensory cortex. Understanding and characterizing the myelin pathology of both models in GM and WM lays a solid foundation for identifying the mechanisms governing demyelination and remyelination, and could lead to the discovery of new targets for treating MS.

Student Presenter: Harrison Fried

Booth Number: 28

Research Mentor: Suzanne Gray

Project Title: The effects of parasites on the visual ability of a cichlid fish

Abstract: Freshwater systems are among the most threatened ecosystems globally due to human-induced changes to the surrounding landscape. Human activities that decrease water quality can lead to fish with increased parasite loads. This study aims to determine if parasites found in the eyes of some fish can affect fish visual systems. In this study, the dwarf Egyptian mouthbrooder (Pseudocrenilabrus multicolor victoriae) was used as a model organism. Specimens were captured from two distinct habitats. Fish from an intact, natural swamp that is considered to have good water quality (Lwamunda Swamp) generally do not have eye parasites. Fish from a poor water quality site (Ndyabusole; a stream fed via agricultural drainage) have high parasite loads. Fish were obtained from Uganda, Africa during 2015 and 2016 field seasons and transported back to Ohio. The visual sensitivity of P. multicolor (n = 15 Lwamunda and 15 Ndyabusole fish) was determined using optomotor response tests. The optomotor response is an innate behavior in fishes (and other animals) in which fish follow a pattern of moving stripes as long as they can detect a difference between the stripes and background. Using a standard approach, light levels were incrementally decreased until the point that the fish stopped following the rotating striped screen. This point is considered the visual detection threshold. Preliminary analysis suggests there is no difference in visual sensitivity between fish from two distinct populations. Further analyses will test if eye parasites influence visual detection thresholds. This study could have important implications for our understanding of how water quality and parasites affect the visual abilities of a tropical fish.

Student Presenter: Daniel Gilbert

Booth Number: 29

Research Mentor: W. Berry Lyons

Project Title: Estimating Relative Surface Ages and Wetting Histories of Ice-Free Antarctic Regions Using Geochemical Analysis of Soils

Abstract: The ice-free regions of Antarctica are polar deserts where atmospheric aerosols are deposited and accumulate overtime in the surface soils. For this reason, types and concentrations of water soluble salts found in these soils can be used as a relative surface age dating parameter. I have measured the elemental composition of soils from several, ice-free locations in Antarctica. They range from coastal sites a few 10s of meters above sea level, to sites 800 kilometers inland and elevations of 2500m. Soils samples were leached with deionized water and filtered through 0.4Âµ filters. The leachate was then analyzed using ion chromatography to determine concentrations of the anions Cl, F, NO3, SO4, and PO4. The leachate was also analyzed by an inductively coupled plasma mass spectrometer to measure the concentrations of Li and B. Locations further inland and at higher elevations tend to have higher concentrations of NO3, and in many cases Cl and B as well. Most coastal sites at high elevations generally had higher Cl values. Chloride, NO3, and B are clearly atmospherically derived, suggesting that if deposition fluxes are known, their concentrations may be good indicators of relative time since last wetted, including periods of glacial coverage. Li concentrations vary the least with elevation and distance, suggesting it is not sourced from the atmosphere, but is produced in-situ via chemical weathering. My data will be compared to previous work on the surface exposure age of these surfaces and discussed in terms of glacier movement during the Pleistocene.

Student Presenter: Daniel Gluck

Booth Number: 30

Research Mentor: Josh Hawley

Project Title: A Financial Analysis of WIOA Recipients in Ohio

Abstract: This summer I researched the impact of different federal and state funded workforce development programs throughout Ohio's 88 counties using various statistical analyses. For the most part, this included tracking unemployed Ohioans who received training and help from the Ohio Department of Jobs and Family Services (ODJFS) and its OhioMeansJobs service centers for the eight quarters between January 1, 2014 and December 31, 2015. The Workforce Innovations and Opportunities Act or WIOA is the main source of funding for these job programs, including special resources for adult and dislocated workers. These two subgroups receive funding for job training, as those groups are the backbone of the labor force. The federal funding is dispersed among states and federal programs to create a network of utility for those affected by the Great Recession. These are high stake programs with multi-million dollar budgets in Ohio. However, if people do not receive the proper job training, they will not be a part of the labor force for long and this could contribute to many problems for the state. My project takes a look to see how these job programs are operating and if they are helping the people they serve. Using databases provided by the Ohio Longitudinal Data Archive and ODJFS, I completed financial analyses after completing many merges and cuts of the millions of records to create readable and informative results about wages and costs by county. I had anticipated to see results that aligned with region type but found something completely different, as the results do not correlate with developed environments, and for ODJFS this was a point of interest for the future. The next steps include comparing these results to the general unemployment statistics in Ohio to see the real effect of these programs compared to the WIOA funded programs.

Student Presenter: Jacob Grimmer

Booth Number: 31

Research Mentor: Loren Wold

Project Title: Obesity and PM2.5 Exposure on Cardiac Function in Exercise Mice

Abstract: Introduction: Studies have demonstrated that particulate matter with diameter <2.5µm (PM2.5) exposure is linked to cardiovascular disease (CVD). Risk factors, such as obesity, correlate with higher occurrences of CVD. We aimed to study PM2.5 effects on cardiac function of obese mice and whether exercise would alter function. Materials and Methods: Obese mice (Ob/Ob) (leptin deficient, FVB background) were exposed to either filtered air (FA) or PM2.5 (within the annual average range of 15 µg/m3 according to National Ambient Air Quality Standards (NAAQS)) for 6 h/day, 7 days/week for 9 months. The mice were divided into 4 groups: (1) FA sedentary, (2) FA exercise, (3) PM2.5 sedentary, and (4) PM2.5 exercise. After exposure, echocardiography was used to examine global cardiac function. Following sacrifice, cardiomyocytes were isolated for studying cardiomyocyte function. Results: Echocardiography showed increased left ventricular end systolic (LVESd) and diastolic (LVEDd) diameters and decreased posterior wall thickness during systole (PWTs) and diastole (PWTd) in Ob/Ob PM2.5 sedentary mice compared to Ob/Ob FA sedentary mice. Morphological alterations were associated with lower systolic function as indicated by reduced percent fractional shortening (%FS) in Ob/Ob PM2.5 sedentary mice compared to Ob/Ob FA sedentary mice. These functional results are suggestive of contractile dysfunction leading to left ventricular volume overload. Cardiomyocytes isolated from sedentary Ob/Ob PM2.5 mice showed marked reduction in positive and negative contractile velocity (±dL/dT) and no change in peak shortening (%PS) suggesting cellular contractile dysfunction. Comparison of mice after 8 weeks of exercise training demonstrated significant decrease in %FS but increase in LVESd and no change in LVEDd in Ob/Ob PM2.5 exercised mice compared to Ob/Ob FA exercised mice. These results indicated exercise induced compensatory improvement in systolic function. Further, a slight decrease in -dL/dT and a marked decrease in +dL/dT was observed in cardiomyocytes of Ob/Ob PM2.5 exercised mice compared to Ob/Ob FA exercised mice indicating improved cardiomyocyte function. Conclusions: PM2.5 exposure in combination with obesity induced cardiac dysfunction as seen through morphological alterations. With exercise, however, obese cardiac function improved suggesting the benefits of exercise.

Student Presenter: Leah Hall

Booth Number: 32

Research Mentor: Carolyn Gunther

Project Title: Project SWEAT: A Community Nutrition and Physical Activity Assessment of Children Who Participate in the USDA Summer Food Service Program (SFSP)

Abstract: Background: Over 1/3 of U.S. children are overweight or obese. Particular windows of risk exist for child weight gain, namely the summer months. Unfortunately, little is known about the causes of summer weight gain among children. Methods: Two Columbus City Schools were recruited and students in grades pre-K-5th were invited to participate. The summer structured programming available to these children was explored. Demographic and anthropometric (zBMI, zWaist Circumference[WC], zSystolic[S] and Diastolic[D] Blood Pressure[BP]) were collected from enrolled children at the end of the 2016-2017 school year and will be collected at the beginning of the 2017-2018 school year. A Project SWEAT Site Environmental Assessment Form will be completed at all structured programming sites in the neighborhoods of the schools by mid-August 2017. Results: 113 children representing 79 families enrolled. Mean age was 7.10±0.21yr, 79.65% were African American, and 72.73% low-income. At baseline, child mean zBMI, zWaist Circumference, zSBP, and zDBP were 0.75±0.10, 0.51±0.08, 1.54±0.11, and 0.97±0.13, respectively. 25 structured programming sites were identified. To date, Project SWEAT Site Environmental Assessment Forms 20 sites. By the conclusion of the summer, all data will be entered into the existing database. StataCorp 14 will be used to explore the nutrition and PA quality of the sites as it relates to changes in child health during summer. Conclusions: Information from this study can be used by stakeholders to reform policy to increase participation in programming in healthy environments to promote health during this established window of risk.

Student Presenter: Maria Hessin

Booth Number: 33

Research Mentor: Robert Siston

Project Title: The Effects of Lower Extremity Muscle Weakening Research Study

Abstract: Muscle s are important in everyday tasks, but when muscles weaken from disease, aging or overuse, these everyday tasks become challenging. Previous biomechanics research shows the two main functions of muscles are to help support us and move us forward. One previous study in my lab concluded that the soleus (a calf muscle) and gluteus maximus had the greatest ability to compensate from weakened quadriceps muscles during walking. Another experiment by Van der Krogt et al. found that most muscle groups could be weakened up to 80% in simulation and still have normal gait kinematics. The goal of my research was to analyze different muscle compensations for 6 weakened muscle groups across fast, self-selected- and slow walking speeds. I took OpenSim simulations of 7 healthy volunteers and virtually weakened a specific muscle group using a MATLAB code, repeating this for 6 muscle groups. The groups were hip flexors, hip extensors, knee flexors, knee extensors, ankle plantar flexors, and globally. Each muscle group was weakened 20%, 40%, 60% and 100%. The Computed Muscle Control tool estimated the forces and activations of each muscle over a walking cycle, and the simulations for each subject, speed, atrophy, and muscle group were run [4]. Each subject's muscle forces and activations across the gait cycle were then averaged and plotted. In general, the compensations were not all the same for each speed. Weakening the knee flexors from 20% to 100% atrophy increases activation of the semitendinosus and semimembranosus (hamstring muscles) for the slow and self-selected gait, but increases activation of the quadriceps muscles called vasti for the fast and self-selected gait. Weakening the hip flexors increases muscle force of the illiacus (a hip muscle) for only the slow and fast gaits, but increases force of the peroneus longus (a muscle lateral to the calf) for only the slow gait. Weakening hip extensors increases activation of all glutes for fast and self-selected, but only increases activation of the single muscle, the gluteus minimus, for the slow gait. For weakened ankle plantar flexors, the psoas increase in muscle force for slow and fast gaits, but not self-selected. Lastly, as knee extensors are weakened, the activation of a quadriceps muscle called the rectus femoris increases in slow and self-selected gait, but not in the fast gait. There was one exception: across all gaits, weakening the hip flexors increased the muscle forces of the vasti and weakening the ankle plantar flexors increased the glutes. Our muscles' ability to support and move us forward are essential aspects to moving properly. Understanding how muscles compensate for each other can improve prosthetics, physical therapies, and assistive devices for persons with disabilities.

Student Presenter: John Hooton

Booth Number:

Research Mentor: Eric Johnson

Project Title: Continuing the Dialogue Abstract

Abstract: It is a common theme in the lives of many LGBTQQIA+ persons (or queer persons) that one must come to terms with one's sexuality or gender identity. For many in the early stages of this self-acceptance process, their sexuality or gender identity is a deviation from the "norm" of cisgender heterosexuality. All queer persons experience "coming out" differently, but it is undeniable that for many, particularly those raised apart from queer culture, the lack of diverse queer representation is harmful. In the absence of such representation, harmful stereotypes and misconceptions allow individuals questioning their identity to experience very negative and painful forms of self-repression. The Brett Shingledecker GLBT Collection at the Ohio State University's Rare Books and Manuscripts Library represents a trove of literature that documents some of the diversity in the larger queer community. The Shingledecker Collection is home to hundreds of 'zines and magazines created by and for members of the queer community. The collection touches on issues of class, race, sex, gender, religion, and sexual practices. When Brett Shingledecker opened Chicago's first queer bookstore, he created a common safe space for people to come and explore, learn, and communicate. Shingledecker's collection could serve as a continuation of the space he created in the 1980s. This summer, I dove into the 'zine and magazine portion of his collection and assigned 'tags' to each item I reviewed, categorizing them based on apparent themes, content, and format. My final product is a guide to this portion of the collection designed for the "amateur" researcher who may be coming to terms with their own or another's sexuality or gender identity. My hope is that this guide will facilitate the Shingledecker Collection's transition into a resource from which the OSU community and beyond may come and learn about queer identity.

Student Presenter: Andrew Hu

Booth Number: 35

Research Mentor: LinLin Yang

Project Title: WEE1 inhibitor AZD-1775 radiosensitizes TP53 mutant esophageal cancer cells in vivo.

Abstract: Background: Esophageal cancer is a deadly cancer that has a 5-year survival rate of 18%; a percentage that has remained unchanged for decades. Esophageal cancer cells often lack a functional G1 checkpoint due to a mutated p53 gene and rely on G2 checkpoint to repair DNA damage. WEE1, a tyrosine kinase, regulates the G2 DNA damage checkpoint of cells, making it a promising target for esophageal cancer treatment. The inhibition of G1, G2 checkpoints combined with radiotherapy would accumulate mutations in esophageal cancer cells to induce apoptosis. Radiotherapy with the WEE1 inhibitor AZD-1775 drug is a potential treatment for esophageal cancer. The purpose of this study was to determine the capacity of AZD-1775 to abrogate the radiation-induced G2 checkpoint arrest and modulate radiosensitivity in esophageal cancer cell (ECC) models. Method: We used a panel of ECC models to test AZD-1775's impact on G2 inhibition and radiosensitivity. Alamar blue assay and clonogenic assay were carried out explore the drug toxicity. Alteration in cell cycle were detected by Western Blot analysis and flow cytometry. Using florescence microscopy, we evaluated effects of AZD-1775 and radiation treatment on mitotic catastrophe and cell death. Results: Results revealed inhibition of G2 checkpoint as evident by the decreased pCDC2/CDK1 when AZD-1775 was introduced. AZD-1775 increased P-H2A.x concentration, signifying the rise in DNA damage and cell death. Introducing radiation amplified G2 checkpoint inhibition and severity of DNA damage. Conclusion: The outcome of the study revealed possible clinical use of AZD-1775. AZD-1775 abrogated G2 checkpoint, prompting more DNA damage and cell death. More cell lines and further analysis will be tested to obtain more data on the mechanism of AZD-1775. If findings remain consistent, in vitro experiments will be conducted. The study signifies the potential of utilizing AZD-1775 alongside with radiotherapy as a treatment for esophageal cancer.

Student Presenter: Katie Hudson

Booth Number: 36

Research Mentor: Kentaro Fujita

Project Title: Mental time travel and construal-level associations: Functional past- and future-directed thinking

Abstract: Mental time travel, the ability to mentally project one's self backward and forward in time, is thought to be crucial for goal attainment (Suddendorf & Corballis, 2007). Construal level theory suggests people think about temporally distant (relative to near) events by engaging in cognitive abstraction (Trope & Liberman, 2003). Whether this process is the same for past vs. future events, however is unclear. We explore whether these processes rely on similar mechanisms. We also examine the functionality of these processes, suggesting those who do not engage in abstraction to think about temporally distant events will have more difficulty attaining their goals. We explore whether one group -- individuals with depression (Strauman, 2002; Trivedi & Greer, 2014) -- represent those whose difficulties stem from employing dysfunctional cognitive tendencies when thinking about the past and future. This study aims to address: 1) what constitutes functional cognition in mental time travel and how this relates to goal attainment and well-being, and 2) whether this cognition is similar between thinking about the past and future. We will begin data collection in August, recruiting Research Experience Program participants. We will assess tendencies to use abstraction to think about past and future events using an Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). Participants will complete the Beck Depression Inventory to measure depressive severity and other related questionnaires (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). We expect similar IAT results between past and future conditions, suggesting people engage in similar abstraction processes when thinking about either. We expect those with more depressive symptoms to show weaker associations between distant time and abstraction. These results would indicate abstraction is a functional response to thinking about distant events (past and future), and may have implications for future research directions in goal pursuit, depression, and cognitive behavioral therapy.

Student Presenter: Macy Huston

Booth Number: 37

Research Mentor: Matthew Penny

Project Title: Making Microlensing Predictions with a Population Synthesis Milky Way Model

Abstract: Due to our perspective on Earth within the Milky Way galaxy, the bar structure of the inner Galaxy is difficult to discern and measure precisely. We do, however, have the ability calculate observables, for example microlensing optical depth and event rate, in models and compare them to real data. I will present my work to develop a new Galactic model simulation code, with the goal of creating one with more flexibility and better output for microlensing calculations. The model incorporates stellar distributions, mass, kinematics, and stellar evolution based on existing models to enable extensive testing, but with the added advantage of interchangeability of model components. The first study done with the model was measuring microlensing optical depth and event rate for a Galactic bar positioned at varying angles to the line of sight (10°, 20°, 30°, 40°, and 50°). The higher angled models fit the optical depth data the best, but one must note that this angle is not the only variable in play, and other model components are being explored. The event rate data did not match well with any of the models, which suggests problems in the model kinematics. The model is currently going through some adjustments based on observed luminosity functions and kinematic data. This adjusted model will then be used to calculate microlensing observables, with the additional inclusion of a microlensing parallax study; this data will be ready for presentation at the September 14th forum.

Student Presenter: Morgan Hyland

Booth Number: 38

Research Mentor: Jonathan Song

Project Title: Development of a FRET-Based Extracellular Matrix Sensor

Abstract: Very little is known about the tumor microenvironment despite the fact that its mechanical properties have been shown to significantly affect the efficacy of a cancer treatment. Precisely determining the mechanical properties of the tumor microenvironment is very challenging because of the complex and rapidly evolving architecture of the tumor extracellular matrix (ECM). Additionally, current state-of-the-art technology available for studying the ECM is incapable of measuring these dynamic changes. To address this challenge, we have developed a DNA origami nanostructure known as NanoDyn that can detect rheological changes of the ECM in in-vitro tumor models. The NanoDyn detects the structural matrix of collagen fibers by generating fluorescence resonance energy transfer (FRET) signals based on whether the device is in an open or closed state. Previous experiments with NanoDyn have verified that it is capable of measuring the overlap concentrations of polymer solutions by detecting FRET signals with a fluorometer. Ongoing research with NanoDyn involves verifying its stability in collagen I, which is the most abundant component of the ECM. Stability of NanoDyn in collagen is tested by adding structures to collagen gel and then imaging with transmission electron microscopy (TEM). The method of combining NanoDyn with collagen is being optimized by adding the positive ions KCl and NaCl to the collagen and NanoDyn solution to promote stability. Once the NanoDyn is stable in collagen I, it can be calibrated in collagen with known concentrations and stiffness profiles. After calibration, NanoDyn can be used to determine the properties of collagen and ECM of an unknown modulus. Based on the polymer solution results, it can be hypothesized that one of the properties NanoDyn can also determine is the viscosity of the collagen gel. Future studies will also use the FRET characterizations of NanoDyn to predict the modulus of individual collagen fibers.

Student Presenter: Karis Inboden

Booth Number: 39

Research Mentor: Xin Feng

Project Title: Maternal Emotion Socialization, Anxiety, and Child Temperament: Prospective Associations with Child Anxiety

Abstract: The developmental course of childhood anxiety is complex, involving biological, psychological and social processes. This study focuses on maternal emotion coaching strategies, and examines how this practice relates to children's anxious behavior. The goals of this study are to examine if and to what extent mothers' emotion coaching behaviors predicts child anxiety above and beyond child temperament and maternal anxiety as well as to examine if and to what extent child and maternal characteristics interactively predict child anxiety outcomes. Participants are 61 mother-child dyads (32 girls) drawn from a larger longitudinal study. At the time of enrollment children were 3.21 years old (SD = .18) and mothers were 31.38 years of age (SD = 5.72). Majority of the mothers were White (73.77%) and Black or African American (24.59%); 60.65% of the mothers had at least a college degree, 31.15% had some college education, and 8.20% had high school education. Maternal emotion coaching was measured during a one day naturalistic observational procedure at home when children were 3 or 4 years old, and mothers completed the State-Trait Anxiety Inventory's trait scale and the Child's Behavior Questionnaire Short Form which measure maternal anxiety and child temperament respectively. Child anxiety was measured during a laboratory task at age 5 wherein children were given three increasingly difficult shape puzzles to complete under a time restriction to illicit anxiety. The videotaped puzzle tasks were coded for child anxiety expression and related behavior such as comfort seeking, discouragement, and help seeking/information gathering. Regression analyses will be conducted using maternal emotion coaching, anxiety symptoms, and child temperament at age 3 or 4 to predict child anxiety expression and related behavior at age 5. This study is unique in that it focuses specifically on mother's emotion socialization, whereas previous studies tend to look at more general parenting behaviors.

Student Presenter: Park Inhyuk

Booth Number: 40

Research Mentor: Ryan Harne

Project Title: Converting Impulsive Kinetic Energy to DC Power for Self-Powered Microelectronics by Tunable, Nonlinear Vibration Energy Harvester

Abstract: There have been many studies for long-lasting energy supplies along with development of microelectronic devices and wireless sensors. Most of these devices are powered by batteries that need to be recharged and replaced on a regular basis. The efforts for this are costly and cumbersome, and many structures where the sensors are located may not have accessibility for humans to undertake the replacements. Due to this challenge, self-powered devices with conversion of ambient vibrations into a usable electric power resource have been thriving in recent years. Kinetic energies are combination of harmonic, stochastic, and impulsive energies depending on the environment and context. Yet, there has been considerably less attention on the available impulsive energy despite the many examples of this energy type, including human walking or running, pulsation of flow in water/oil pipelines, vehicle driving over spanned bridges or speed bumps, and wind gusts. As a result, investigations are needed to identify suitable energy harvesters that have high sensitivity to impulsive excitation. Recent studies have shown that bistable energy harvesters are generally sensitive to impulsive excitation. Motivated by these early findings, this research establishes a system of bistable energy harvesters driven by non-contact magnetic repulsion to convert the piezoelectric beam strain into DC electric power. Experimental and numerical investigations are conducted to characterize the effectiveness of the tunable, nonlinear vibration energy harvesting system to maximize the captured kinetic energy and to explore system configurations that optimize the DC power delivery. The results of this research are assessed to identify strategies for maximizing sensitivity of the vibration energy harvesting platform to the impulsive excitations.

Student Presenter: Guneet Janda

Booth Number: 41

Research Mentor: Thomas Magliery

Project Title: Sequence, Structure, and Stability in Pheromone Er-23: a Disulfide Rich ProteinÂ¬

Abstract: This project aims to illustrate the relationship between protein sequence, structure, and stability in the context of a protein Er-23, a pheromone secreted by the protozoan Euplotes raikovi. Er-23 is 51 amino acids long and has 10 cysteine residues in 5 disulfide bonds, whose role in the stability and structure of the protein are of particular interest. The literature suggests that the structure of the protein is driven by the formation of disulfide bonds, and is supported by the currently accepted 3-D structure of the protein. Our working hypothesis is that the folding of the protein is driven primarily by the amino acid sequence, while the disulfide bonds play a role in the overall stability of the protein. We have successfully expressed Er-23 in E. coli, a heterologous expression system, and will use solution state NMR Spectroscopy, Mass Spectrometry, X-Ray Crystallography and CD Spectroscopy to elucidate the precise structure and compare it to that of the homogolously expressed protein. Our current data suggest that the protein spontaneously adopts its native conformation in E. coli, and we aim to corroborate this through denaturation and refolding experiments. Additionally, our NMR and Mass Spectrometry data suggest that the disulfide bonds and overall structure of the protein may differ from that of the reported structure. This fundamental information about the interplay between protein fold, stability, and sequence can be useful in the future investigation and design of novel proteins.

Student Presenter: Cody Justice

Booth Number: 42

Research Mentor: Sakima Smith

Project Title: The Impact of Pazopanib on the Cardiovascular System.

Abstract: Background: Pazopanib was FDA-approved in 2009 and has become the first line of treatment for renal cell carcinoma. Pazopanib is a tyrosine kinase inhibitor that slows tumor growth and angiogenesis by its action on vascular endothelial and platelet-derived growth factor receptors. Unfortunately, the efficacy of this drug is limited by its cardiovascular toxicity, including hypertension. Goal: Gain a greater understanding of the mechanism of these side effects in order to: 1) identify patients who are at higher risk; 2) develop strategies to mitigate cardiovascular toxicity; and 3) aid in future drug development. Hypothesis: The hypertensive effects of pazopanib are due to sustained activation of the renin-angiotensin-aldosterone system (RAAS). Methods: Wild type mice were dosed with 30 mg/kg of pazopanib twice daily for 42 days. Cardiac-specific beta-II spectrin knockout mice and flox control mice were dosed with 100 mg/kg once daily for 22 days, and an additional cohort was co-treated with lisinopril (RAAS inhibitor). Blood pressures were monitored throughout treatment. Electrophysiological studies were conducted on isolated cardiomyocytes. Results: Pazopanib treatment led to an increase in blood pressure in all mice that received pazopanib. After 42 days, precursors to ventricular arrhythmias, such as delayed afterdepolarizations and prolonged action potential duration, were detected in cardiomyocytes. In mice that received 100 mg/kg of pazopanib, lisinopril co-treatment attenuated pazopanib-induced blood pressure rise and enlargement of the heart. Discussion: These results support our hypothesis regarding the involvement of the RAAS pathway, and validate the use of lisinopril for mitigating the hypertensive effects of pazopanib. Notably, the mechanism by which various tyrosine kinase inhibitors lead to hypertension may vary. Conclusion: Lisinopril is effective at attenuating the hypertensive effects of pazopanib, and it is worth determining whether the cardioprotective qualities of lisinopril are dependent upon blood pressure.

Student Presenter: Nicole Kinash

Booth Number: 43

Research Mentor: Ann Cook

Project Title: Recovery and lithologic analysis of sediment from Hole UT-GOM2-1-H002, Green Canyon 955, northern Gulf of Mexico

Abstract: In May 2017, the University of Texas led a drilling and pressure coring expedition in the northern Gulf of Mexico, UT-GOM2-01. The holes were located in Green Canyon Block 955. Two separate wells were drilled into this unit: Holes H002 and H005. In Hole H002, a cutting shoe drill bit was used to collect the pressure cores, and only one of the eight cores collected was pressurized during recovery. The core recovery in Hole H002 was generally poor, about 34%, while the only pressurized core had 45% recovery. In Hole H005, a face bit was used during pressure coring where thirteen cores were collected and nine cores remained pressurized. Core recovery in Hole H005 was much higher, at about 75%. Herein, we focus on lithologic analysis of Hole H002, with the goal of documenting and understanding core recovery in Hole H002 to compare with Hole H005. X-ray Computed Tomography (XCT) images were collected by Geotek on pressurized cores, mostly from Hole H005, and at Ohio State on unpressurized cores, mostly from Hole H002. The XCT images of unpressurized cores show minimal sedimentary structures and layering, unlike the XCT images acquired on the pressurized, hydrate-bearing cores. Only small sections of the unpressurized cores remained intact. The unpressurized cores appear to have two prominent facies: 1) silt that did not retain original sedimentary fabric and often was loose within the core barrel, and 2) dense mud sections with some sedimentary structures and layering present. On the XCT images, drilling mud appears to be concentrated on the sides of cores, but also appears in layers and fractures within intact core sections. Further analysis of the unpressurized cores is planned, including X-ray diffraction, grain size analysis and porosity measurements. These results will be compared to the pressurized cores to understand if further lithologic factors could have affected core recovery.

Student Presenter: Grace Klosterman

Booth Number: 44

Research Mentor: Dustin Huber

Project Title: Motion Sickness Interactions with Spine Disorders

Abstract: The world of low back movement quantification has been revolutionized through the invention of the Clinical Lumbar Motion Monitor (cLMM) in the 1980's by Dr. W.S. Marras of the Spine Research Institute (SRI) at Ohio State. This wearable exoskeleton collects position, velocity, and acceleration data from a subject's back in the sagittal, lateral, and twisting planes, in order to create a three-dimensional kinematic trunk "motion signature". The cLMM is a validated tool capable of objectively measuring the functionality the of a low back, including injury. Low back injury costs the Navy over $240 million, occurring in connection to motion sickness in 50-90% of aircrew. Some aircrew members, however, have a high tolerance to motion sickness (MS), which is not well understood. The goal of this experiment is to collect motion signatures from eight subjects of the military population at Wright-Patterson Air Force Base, and compare these signatures between subjects. Following IRB consenting, subjects performed a pre-MS LMM screening, incurred MS-inducing stimulus in the Neuro-Otologic Test Center (NOTC) at a rate of 10 rpm for up to 30 minutes, and a post-MS LMM screening. Via comparison of the low tolerance group to the high tolerance group, objective data regarding the changes in an individual's motion signatures following motion sickness exposure can be obtained. In further studies, a database will be developed of military members with healthy low back motion signatures who are nevertheless prone to motion sickness and those who are not. These data could then be used to predict which individuals are at risk of motion sickness. By analyzing the differences between the at-risk versus high threshold groups, training protocols could be developed to teach aircrew how to not only mitigate motion sickness, but also low back disorders.

Student Presenter: Jack Korenyi-Both

Booth Number: 45

Research Mentor: Lisa Bielke

Project Title: Evaluation of effects of different Necrotic Enteritis models

Abstract: The purpose of this research is to evaluate the effects of different Necrotic Enteritis models. Furthermore, this project should shed light on the problems of Necrotic Enteritis in the poultry industry, specifically in chickens. Necrotic Enteritis is a multifactorial acute enterotoxemia, that is often fatal and costs the United States about $6 billion annually. In this experiment, 9 sets of birds will have different treatments, including a negative control, different strands of Eimeria, and different forms of Clostridium Perfringens. Through the analyzation of lesion scores, mortalities, body weights, and necropsies, the different models will be evaluated for severity of Necrotic Enteritis. These results will provide insight regarding the most effective Necrotic Enteritis model, which in return allows for preventative methods to be backed by research and science.

Student Presenter: Michael Kovacevich

Booth Number: 46

Research Mentor: Jim Beatty

Project Title: Analyzing the Correlation between High Energy Neutrinos and Cosmic Rays

Abstract: Neutrinos are nearly massless particles that pervade the universe while cosmic rays are charged particles, such as the nuclei of atoms, that contain very high energies. Since neutrinos are neutral particles, they only interact via the weak force and gravity, however, cosmic rays are charged particles so they interact with the electromagnetic force. As a result of neutrinos being electrically neutral, they are able to travel straight from their source relatively unaffected; cosmic rays are affected by magnetic fields and this results in their paths being bent. While there is a general understanding of how neutrinos and cosmic rays are produced, a question that remains to be answered is how high-energy neutrinos (HEv) and high-energy cosmic rays (HECR) are produced and what sources are capable of accelerating these particles to such high energies. The purpose for this correlation study comes from the idea that HEv and HECR may be produced by the same astrophysical sources. Using data from the IceCube experiment, it is possible to create a window around each detected HEv and measure how many HECR pass through this window. Comparing the amount of detected HECR per window to the expected amount of HECR per window allows for a correlation value to be calculated and in turn see if this correlation value is statistically significant. In order to calculate the expected amount of HECR per window, a model has been created that uses Monte Carlo methods to randomize the HECR events. Depending on how many windows have a statistically significant correlation value would help to either confirm or deny that HEv and HECR tend to originate from the same astrophysical sources. These results could give insight into which astrophysical sources produce HEv and HECR while also explaining how they obtain such high energies.

Student Presenter: Divya Krishnagiri

Booth Number: 47

Research Mentor: Nathan Doble

Project Title: Automatic Identification of Rods and Cones in High Resolution Retinal Images of the Living Human Eye

Abstract: Adaptive optics scanning laser ophthalmoscopy (AO-SLO) allows researchers to visualize individual cones and rods in the human retina. While it is relatively straightforward to automatically detect the centers of each cell, distinguishing between cones and rods is time-consuming and prone to human error. The purpose of this work is to create an algorithm that can automatically differentiate cones from rods. A Matlab algorithm was developed that uses a combination of three metrics to classify cells as cones or rods. The first step is to identify all cells in the high resolution AO-SLO image using an established method based on detecting local intensity maxima. For each of these identified cells, the following measurements are made: 1) Intensity at the center of the cell; 2) cell-to-cell nearest neighbor spacing; and 3) slope of the average radial profile around the center of the cell. A machine learning approach is being explore using a training set of manually identified cones and rods, to determine how to best use these three variable to automatically classify the cells. Based on the AO-SLO training set from 10° in the temporal retina, mean intensity was larger for cones compared to rods (170 ± 69 vs. 101 ± 42). Cell-to-cell spacing offers better discrimination: 8.1 ± 1.3 μm (cone), vs. 2.5 ± 0.4 μm (rod). Slope of the radial profile (measured at r = 1.6 μm) was steeper for cones: 0.28 μm-1 (cones) vs. 0.10 μm-1 (rods). These numerical parameters are used to distinguish cones from rods. Of the three variables, Cell-to-cell spacing provides the best discrimination, though a combination of all three will be investigated in the future to provide more accurate identification. Automated detection of cones and rods will save time and aid in the identification of abnormal photoreceptor patterns and early detection of disease.

Student Presenter: Megan Kruze

Booth Number: 48

Research Mentor: Ajit Chaudhari

Project Title: The Effects of Weight on a Prosthetic Hand

Abstract: The loss of a hand can be detrimental. An externally powered hand prosthesis may restore function and improve quality of life, but little research has been done on these devices. The purpose of this study was to examine how the weight of an object affects the functionality of a myoelectric prosthetic hand. Partial-hand amputees (6 male) performed the Southampton Hand Assessment Procedure (SHAP), which involved the participants moving identical light and heavy objects in a specific pattern while self-timing. Twelve tasks (heavy and light sphere, triangular prism, cylinder, box with tab on the side, small rectangle, large rectangle) were performed with and without the prosthesis. Three-dimensional data were collected at 150 Hz using passive marker motion capture (Vicon). Upper-limb kinematics were statistically analyzed to determine differences in joint range of motion (ROM) between prostheses conditions to determine movement differences between heavy and light object manipulation. The non-prosthesis condition resulted in several increased ROM during heavy tasks compared to light tasks: sphere (all variables p<0.05), small rectangle (scapula up/downward rotation p=0.03; wrist flex/extension p=0.008). This condition resulted in decreased ROM during the heavy triangular prism task (all variables p<0.05). The prosthesis condition resulted in fewer differences with increased ROM seen in heavy tasks: large rectangle (elbow flex/extension p=0.02; supination/pronation p=0.05), sphere (trunk flex/extension p=0.03). It also demonstrated decreased ROMs in the heavy box task (shoulder adduction/abduction p=0.05; elbow supination/pronation p=0.0009). These findings indicate the prosthesis appeared able to adjust to the task at hand whereas the amputees were required to change their movement strategies without their prosthesis, resulting in severe differences based on object weight. The ability of the prosthesis to adapt may prove beneficial in reducing secondary injuries. Future work will focus on comparing the limb-loss group to two-handed control outcomes to determine how well the prosthesis mimics healthy function.

Student Presenter: Jonathan Kubesch

Booth Number: 49

Research Mentor: David Barker

Project Title: Edaphic and morphological variance in running buffalo clover (Trifolium stoloniferum) ecology

Abstract: A pH study seeks to expand on earlier edaphic investigations, determining the role in RBC growth. Additionally the study explores RBC's potential soil acidification (Barker and Kubesch 2017, unpublished data). Determining pH optima would, with the additional of other ecological indicators, screen the range for potential remnant populations or selecting priority conservation sites (Burkhart et al 2013; Morris et al 2002). Habitat specificity produces management implications, and with pH determining nutrient availability, pH optima may also correlate with site suitability for edaphic manipulations (Hattenbach 1996; Brady and Weil 2010; Morris et al 2002). Since the primary threat to running buffalo clover is loss or modification of habitat (Selbo et al, 2015), one option for restoration of this species is identification of suitable areas for re-introduction. A morphological characterization study uses common agronomic and taxonomic characters to delineate populations across the Ohio and Kentucky portion of the species range as well as developed initial morphological documentation of underlying genetic diversity. This serves as a cost-effective screen for possible genetic studies as well as supported present efforts to assign management priorities to specific populations. Determining priority populations serves as a practical goal as funding becomes available for genetic investigation. A third study seeks to determine optimal transplantation protocols as well as the role of greenhouse intervention in in situ and ex situ conservation of running buffalo clover.Improving repatriation with this crucial step in propagation should increase success rates and allow researchers to factor in additional population biological information into such projects; logistical challenges overcome, larger genetic and ecological questions in restoration might be addressed.

Student Presenter: Julia Kumar

Booth Number: 50

Research Mentor: Olga Kokiko-Cochran

Project Title: Investigation of Acute Sleep Disruption after Traumatic Brain Injury

Abstract: Traumatic brain injury (TBI) results in chronic sequelae including insomnia and other forms of disordered sleep. Increasing evidence demonstrates that sleep disruption (SD) alone induces neuronal degeneration and cell loss, alters stress and immune responses, adversely affects neuroendocrine and metabolic systems, impairs coping ability and emotional resilience, and impairs attention and cognitive function. Thus, SD is predicted to exacerbate pathological, behavioral, and physical symptoms post-TBI, ultimately impairing recovery. However, the extent of the relationship between SD after TBI and the resulting neurological effects on patient outcome has not been determined. This study aims to further investigate the effects of acute post-injury SD focusing on behavioral and immunological outcomes. In this case, SD was operationally defined as three days of minimally invasive handling from 7-11am. Mice remained in their home cage during SD with access to food and water ad libitum. Preliminary results confirm that this model of acute SD resulted in increased anxiety-like behavior and altered cortical cytokine expression in naïve 8-week-old C57BL/6 mice. Follow-up studies characterized the neuropathological consequences of SD following TBI. Lateral fluid percussion TBI or sham injury was administered to equal numbers of 8-week-old male and female C57BL/6 mice. Notably, post-injury SD increased disinhibition in the elevated zero maze, decreased cortical expression of anti-inflammatory cytokines, and altered the spatial distribution of reactive microglia/macrophages. Together these data suggest that three days of SD is sufficient to alter the neuroinflammatory environment and behavior, which is further enhanced following TBI. Continued investigation will be key in further defining the neurological effects of SD after TBI, particularly as a greater understanding of post-injury risks is critical in optimizing patient recovery. Future studies will analyze the role of SD in the presentation of Alzheimer-like neuropathology after TBI.

Student Presenter: Sasha Larocque

Booth Number: 51

Research Mentor: Tom Darrah

Project Title: Shallow Aquifer Methane Evaluation in the Appalachian Basin

Abstract: Unconventional drilling techniques are continuing to be a significantly utilized resource for hydrocarbon extraction from the Earth. With this, come many concerns regarding the environmental effects that may coincide with unconventional drilling. However, there are insufficient pre-drill data available to determine the consequences involved with unconventional drilling. Commonly, gas geochemistry can establish hydrocarbon contamination in aquifers. In addition, noble gas geochemistry has been implemented to understand the origins and migration pathways. Yet, without pre-drill data, the true mechanism of the contamination may be inconclusive. New York remains a relatively untapped natural gas source and because of this, provides an opportunity to conduct baseline shallow aquifer analysis prior to unconventional drilling. With this in mind, we hypothesize that the migration of hydrocarbons in to shallow aquifers is natural and useful for constraining natural gas mechanisms. We analyzed 65 water samples obtained from six counties in New York for their chemical composition. All hydrocarbons (CH4-C5H12) were tested in addition to 3He, 4He, 20Ne, 36Ar and other isotopes. Certain samples had heightened levels of hydrocarbons and interesting variations in noble gas compositions. In addition, 3He/4He ratios were also producing a signature of thermally mature gas in the shallow aquifer. By comparing some of these elevated readings, we were able to infer the origins of the hydrocarbons that were found in the water samples. Higher order hydrocarbons (ethane, propane) are commonly associated with thermogenic gas. Methane is also a key component in thermogenic gas but is nearly exclusive in biogenic gas. Thermogenic origins indicate the migration of gas and by determining this in numerous samples, we were able to develop a baseline composition reading prior to any future implementation of unconventional drilling in New York.

Student Presenter: Michael Lee

Booth Number: 52

Research Mentor: Hanna Cho

Project Title: Characterization of Interphase Forces in Lithium-ion Battery Electrodes via Atomic Force Microscopy

Abstract: The long-term performance of ion-based battery cells is contingent upon the mechanical integrity of the constituent compounds. Characterization of interphase forces between common electrode materials will offer insight into the selection of materials for optimized battery performance. Atomic force microscopy (AFM) characterizes the surface of a sample with the nanoscale tip of a cantilever, gathering high-resolution imagery and force data. By applying AFM to samples of electrode constituents, key material properties such as adhesive force and elastic modulus can be quantified and linked to specific microscale structures of sample materials. The present study uses contact AFM force mapping to aggregate data showing the interphase forces exhibited by common polymer binder material polyvinylidene fluoride (PVdF). This study examines the properties of raw PVdF as well as those of mixtures of PVdF with particulate carbon and active material, and scrutinizes the response of this material to prolonged contact with electrolytic solution. In each of these cases, images and characteristic material property data were collected. In addition to this characteristic data, analysis of the response of AFM readings to methodology was prioritized. The effects of cantilever selection, calibration, and several interpretive contact mechanics models on the material property data were examined. The methodology constructed in this study will provide a baseline for the future characterization of interphase forces exhibited by other polymer binders.

Student Presenter: Fangze Liu

Booth Number: 53

Research Mentor: P. Chris Hammel

Project Title: Optical Detection of Damping in Driven Ferromagnetic Systems using NV Centers in Diamond

Abstract: Sensitive local measurement of magnetization dynamics improves understanding of the underlying physics of complex magnetic systems and can provide insights for next-generation materials engineering, magnetic memory applications, and microwave technologies. Here we use an atomic-sized crystallographic defect in diamond, called the nitrogen-vacancy (NV) center, to understand relaxation, commonly referred to as damping, of ferromagnetic systems at the nanoscale. When ferromagnetic resonance (FMR) is excited, some energy in the uniform precession of the ferromagnetic spins decays into other, finite-wavelength magnetic excitations in the magnet called spin waves. These spin waves interact with proximal NV centers, causing transitions of the NV from spin state ms=0 to ms=±1, reducing the photoluminescence (PL) of the NV, thus enabling detection of the NV's spin state. Ultimately the local behavior of the ferromagnetic uniform mode resonance, including its linewidth, can be read out via the NV center. Therefore, NV centers can be used as local probes of ferromagnetic damping by measuring the FMR linewidth. We investigate the microwave power, frequency, and spatial dependence of FMR damping in order to better understand the magnetization dynamics of ferromagnetic materials.

Student Presenter: Thomas Malinich

Booth Number: 54

Research Mentor: D Elder

Project Title: Hydroponics During the Ghanaian Dry Season

Abstract: Food security in Ghana is one of the most worrisome aspects of life for locals. This project introduced stationary hydroponics in a small town in Ghana to give farmers methods of cultivating vegetables for the dry season. Hydroponics is known for the growth of high quality and quick turnover crops. For the case of Ghana, a simple system was made by filling a Styrofoam container with nutrient solution and placing the seedlings into holes on the containers lid. The system itself was successful, however, the time between sowing and transplant were made longer after the first crop was lost to transplant shock. The crop that was transplanted later was highly successful and was harvested multiple times in a single crop cycle.

Student Presenter: Katy McFarland

Booth Number: 55

Research Mentor: John Grinstead

Project Title: A neurolinguistic study of monolingual Spanish-speaking children with Specific Language Impairment

Abstract: Specific Language Impairment (SLI) is a disorder that affects the mastery of language skills for children across all languages. The current study focuses on further developing the SLI profile of monolingual Spanish-speaking children. We know from previous SLI literature that English-speaking children affected with SLI show deficits with tense marking on verbs (e.g. he walks), but have no deficits with number marking on nouns in identical linguistic contexts (e.g. three rocks). In contrast, for monolingual Spanish-speaking children with SLI, the issue of number marking vs. tense marking is less clear. This project will compare a sample of monolingual Spanish-speaking children diagnosed with SLI and typically-developing controls in reaction to both ungrammatical plural noun phrases (e.g. dos gato – "two cat") and to ungrammatical tense marking (e.g. Ayer yo duerme. "Yesterday I sleep."). The objective of this project is to determine whether child Spanish-speakers with SLI perceive each of these kinds of ungrammaticality as equally bad or, as asymmetrically problematic. If children with SLI perceive these ungrammaticalities as asymmetrically problematic, the data should demonstrate that SLI kids would not accept the plural noun violation, but would perceive the tense marking violation as grammatical. To execute our study we will use a neuro-linguistic methodological approach called event-related potentials, or ERPs. ERPs are collected by the process of running an electroencephalogram (EEG) while administering language tasks to participants. Electrical responses are recorded from the scalp and further analyzed using computer software to show the neural patterns behind language comprehension. Understanding the neural basis of SLI has relevance to the development of sufficient criteria for recognizing SLI in children, something imperative to adequate therapeutic intervention in the classroom.

Student Presenter: Ryan Messer

Booth Number: 56

Research Mentor: Kristine Yoder

Project Title: Expression and purification of nuclease free Protocatechuate 3,4-Dioxygenase for prolonged single-molecule fluorescence observations

Abstract: Single-molecule (SM) microscopy is a dynamic way to visualize biological reactions in real time. It is commonplace in SM techniques to utilize fluorophores to fluorescently label molecules so that interactions can be studies. A major drawback in SM imaging is the photobleaching of fluorophores which ultimately leads to the end of data collection. This phenomenon is caused by a photochemical association with dissolved oxygen O2. To resolve this issue, oxygen scavenging systems (OSS) are routinely used to diminish O2 through biochemical means. A drawback to commercially prepared OSS is the presence of nucleases that can adversely interact with nucleic acid substrates. Here we have outlined a method for the overexpression and purification of protocatechuate-3,4-dioxygenase (PCD), from Pseudomonas putida, leading to no detectable nuclease contamination. When this purified enzyme is used with its cohort protocatechuic acid (PCA), it can greatly improve the photostability of Cy3 as shown through SM experimentation. The data presented shows that this method is effective in producing superior PCD in cost, quality, and activity when compared with commercially prepared PCD.

Student Presenter: Caroline Miller

Booth Number: 57

Research Mentor: Derek Hansford

Project Title: Cells on Gels: Biomimetic micron-scale polyacrylamide gel substrates for studies of GBM cell adhesion and migration

Abstract: Glioblastoma Multiforme (GBM) is the most commonly diagnosed brain tumor and has a median survival time of 15 months, which is partly due to the cells' highly migratory behavior. An ability to test individual resected tumors to classify the prognosis based on cell migration behavior is of great interest. To study the cell migratory behavior a substrate that mimics the brain white matter tracts and can be seeded with cells needs to be established. This biomimetic environment was created using polyacrylamide (PA) of 1kPa, 10kPa, and 120kPa that was micropatterned with 2µm features to mimic in vivo stiffness and fibrillar structures. A liquid PA mixture of varying ratios of bis-acrylamide and acrylamide to get different stiffnesses was pipetted onto a sacrificial polystyrene (PS) mold with the 2µm pattern, created by stamping a PS coated coverglass with a PDMS mold at high heat. An amine-coated glass coverslip was then placed on top of the mixture and allowed to polymerize. This protocol produced micron scale features on PA gels of varying stiffness that were uniform in diameter and thickness. The gels were then treated with fibronectin to encourage focal adhesion of cells and seeded with cells at a density that allowed the observation of individual cell migration. After incubation for 24 hours the cells were analyzed. Initial cell attachment and morphology was dependent on substrate stiffness. The cells attached quicker and exhibited higher degrees of elongation on stiffer gels. This demonstrated that stiffness influences cell attachment and migration, emphasizing the need for low stiffness patterned substrate to properly mimic in vivo conditions. This procedure can aid in analyzing disease-specific behavior and eventually patient-specific prognostic information. This data could also aid in research on inhibiting migration of cancer cells, possibly by changing the stiffness of the environment the cells migrate on.

Student Presenter: Mary Fiona Molloy

Booth Number: 58

Research Mentor: Brandon Turner

Project Title: What's in a response time?: On the importance of response time measures in constraining models of context effects

Abstract: Context effects are a phenomena of multi-attribute, multi-alternative decision-making that contradict normative models of preference. Numerous computational models have been created to explain these effects, an explanation that is communicated through the estimation of model parameters. Historically, parameters have been estimated by fitting these models to choice response data alone. In other contexts, such as those studied in perceptual decision-making, the times associated with choice response have proven effective in better understanding and testing competing theoretical accounts of various experimental manipulations. Here, we explore the advantages of incorporating response time distributions into the inference procedure using the most recent model of context effects--the Mulitattribute Linear Ballistic Accumulator (MLBA) model--as a case study. First, we establish in a simulation study that incorporating response time data in the inference procedure does indeed produce more accurate estimates of the model parameters. Second, we extend the results of our first study to investigate whether or not the accuracy of parameter estimates is modulated by the number of observations or the specific parameter values used to generate the data. Third, we generalize our results beyond the MLBA model by using likelihood-free techniques to estimate model parameters. Finally, we investigate parameter differences when choice or choice response time data are used to fit MLBA by fitting the models to real data from a perceptual decision-making experiment. Based on likelihood-free and likelihood-based estimations of both simulated and real data, we conclude that response time measures offer an important source of constraint for models of context effects.

Student Presenter: Callie Moore

Booth Number: 59

Research Mentor: Thomas Magliery

Project Title: Development of Binding and Stability Assays of the Anti-tumor Ab Fragment 3E8 for High Throughput Cancer Screening

Abstract: Tragedy falls upon more than 1,500 people a day when they lose their battle with cancer. Surgical resection of the cancerous tumor continues to be one of the most successful methods of cancer treatment. In order to remove cancerous tumors, the surgeon needs to have the ability to differentiate healthy from diseased tissue. Doctors use cancer imaging for this specific reason. In order to see the cancer, a tumor antigen, which is an antigenic substance produced within tumor cells, can be used as a marker. One of these tumor antigens is Tag72 which contains a unique sugar, Sialyl-Tn. The Magliery lab has engineered an antibody fragment, 3E8.scFv, that is able to specifically bind to this disaccharide. Using the knowledge founded in this lab, it is our hope that surgeons will soon have a more proactive way to screen for cancer. There are still many tests needed to be performed in order to make sure this method is as safe and effective for the patients as possible. Specifically, my research involves the further engineering of 3E8.scFv and the performance of immunohistochemistry on cancerous tissues positive for Tag72. Our research is working towards learning more about the binding and stability properties of the antibody 3E8 in order to provide an effective way for surgeons to screen for cancer and safely remove the cancerous tumor.

Student Presenter: Ben Novotny

Booth Number: 60

Research Mentor: Boian Alexandrov

Project Title: Mechanical and Materials Properties of Brazed Joints

Abstract: High temperature brazing serves a variety of purposes. One purpose is to create parts made of nickel based superalloys used in gas turbines. Considerations must be given to the mechanical properties and atomic makeup of these brazed joints. Failure within a gas turbine could lead to catastrophic damage and the loss of life. The data gathered will be used to anticipate the mechanical properties of these brazed joints and to determine the limits of their strength. The first project conducted examined the fraction eutectic of the nickel superalloys Inconel 718 and CMSX-4 which were brazed with BNi-9 Filler metal. Furnace brazing cycles with peak temperatures of 1100C, 1150C, and 1200C were examined at hold times of 15 minutes, 45 minutes, and 90 minutes. Due to a complication with a light radiation furnace, not all trials have been completed. Data for all temperatures at hold times of 15 and 90 minutes have been gathered for both superalloys. Three out of the four data sets displayed a linear relationship which suggests the fraction eutectic of both superalloys can be predicted when using BNi-9 filler metal. The second project examined the effects of tensile loading on single and double lap joints which were torch brazed with BAg-34 filler metal. Samples were brazed with overlaps of 1 Thickness (1/8th inch) - 5 Thickness (5/8th inch). Samples were subjected to tensile loading in an MTS tester until failure. The project is ongoing and analysis will be conducted of the stress experienced by the samples and the shear strain in the damage zone. The results of both projects are intended to aid Rolls Royce in the development of their jet engine turbines. The information gathered on braze microstructures and mechanical properties will make the production of parts simpler to reproduce.

Student Presenter: Collin Oborn

Booth Number: 61

Research Mentor: Michael Barton

Project Title: Magma plumbing system beneath Herðubreið, Northern Rift Zone, Iceland

Abstract: Iceland is the most volcanically diverse location on the planet as nearly every type of volcano can be found on this island. Volcanoes are an existential and powerful threat to the modern world on both short and long time scales, and understanding their inner workings is paramount to protecting society from one of nature's deadliest and most destructive activities. Given that gathering and analyzing information about every type of volcanic activity on Iceland is a daunting task, this study focuses on a specific locality in Iceland's Northern Volcanic Zone, the volcano known as Herðubreið (Herdubreid). The purpose of this research was to determine the depth of crustal magma bodies that feed Herðubreið. The methods of this project involved using the analyzed weight percent of major oxides in samples of glass collected from the volcano over the last few years to calculate the pressure at which the magmas partially crystalized. From this pressure we established the relative depth of the magma chamber or chambers located in the underlying crust. The results reveal the presence of two main magma bodies located at 11 and 17 km below the surface. These depths were expected as they agree with the results of seismic studies for this area and are consistent with results obtained using identical petrologic methods for other volcanic plumbing systems in Iceland. This work provides part of the bigger picture of Icelandic volcanism, as Herðubreið is only one of about thirty active volcanoes on Iceland. However, while the results of this work constitute a necessary first step for improving warning systems and updating evacuation procedures for people who live or work near similar types of volcanoes, more work is needed to gain a complete picture of the magma plumbing systems in the crust beneath Iceland. Additional research is underway to collect and study samples from these volcanic systems with the objective of understanding how these different types of volcanoes work, how the different plumbing systems interact with each other, and how to place the results obtained for Iceland into a global context.

Student Presenter: Nathaniel Olson

Booth Number: 62

Research Mentor: Nicholas Brunelli

Project Title: Imogolite Nanotubes as a Catalyst for Biomass Conversion

Abstract: Rising energy costs and concerns regarding climate change necessitate the development of efficient and sustainable processes for the production of fuels and chemicals. Catalysts are an attractive solution to minimize the cost and environmental impact of these processes. One important process is biomass conversion, which can be employed to produce 5-hydroxymethyfurfual (HMF). HMF is a valuable intermediate for the sustainable production of biofuels, plastics, and valuable chemicals. It is produced by the cascade reaction of glucose to fructose to HMF. Several intriguing catalysts for the isomerization of glucose to fructose have been identified, including immobilized enzymes, triethylamine, and zeolites. While these catalysts have sparked immense interest in this area, further research is necessary to identify novel catalysts for the isomerization reaction that are cost effective and environmentally friendly. The purpose of this research is the study of imogolite nanotubes as a catalyst for the isomerization reaction. Imogolite nanotubes offer a highly tunable platform and the capability to design an effective heterogeneous catalyst. The successful synthesis of imogolite nanotubes has been confirmed. Preliminary catalytic tests on the imogolite nanotubes show promising activity for the isomerization reaction. Further work includes the determination of the active site of imogolite that is responsible for the catalytic activity. An opportunity to improve the selectivity of the imogolite catalyst for fructose lies in modification of the nanotube structure and composition through changes to the synthesis procedure. The results of preliminary tests establish that imogolite has the potential to be applied as an effective isomerization catalyst. Through further investigation of the nature of the catalytic activity, imogolite could be a novel catalyst that aids in the efficient, eco-friendly, and sustainable production of fuels and chemicals from biomass.

Student Presenter: Irene Onianwa

Booth Number: 63

Research Mentor: Andre Palmer

Project Title: Hemoglobin Release Kinetics from Alginate Beads

Abstract: The purpose of this study is to analyze the diffusion kinetics of hemoglobin encapsulated calcium alginate beads. The parameters of the beads included needle diameter, drop distance, and shape. This study analyzes the varying concentrations of hemoglobin, alginate, and calcium chloride used in the production of the beads and how they impact diffusion of the beads. The various β-D-mannuronic to α-L-guluronic acid ratios of alginate were examined to find the most effective proportion for hemoglobin diffusion. The objective of this study is to get hemoglobin to successfully diffuse over 10 hours without changing its properties. The results of this analysis can be used as another application of hemoglobin based oxygen carriers where the diffusion rate of hemoglobin can be manipulated.

Student Presenter: Jack Pelishek

Booth Number: 64

Research Mentor: Ralph von Frese

Project Title: Seeing Through the Salt: An Integration of Gravity and Seismic Datasets in the Unexplored Laurentian Basin

Abstract: Integrating gravity anomaly data with seismic reflection profiles lowers exploration risk and enhances the geologic interpretation of a basin. This project focuses on pinpointing the location of salt diapers offshore Canada within the Laurentian Basin. Salt domes provide phenomenal hydrocarbon traps in about 50% of the world's hydrocarbon basins, so studying salt behavior is critical in understanding the mechanisms of the Laurentian petroleum system. Combined seismic and gravity studies are effective for mapping salt domes because of the large respective velocity and density variations of the subsurface that they provide. Thus, these approaches are prevalent in industry plays such as the North Sea, Barents Sea, and the Gulf of Mexico for lowering exploration risk. This study considers their application in the largely unexplored Laurentian Basin that holds deep-water Mesozoic extensional structures and salt tectonics related to the Triassic split of the Atlantic Ocean. In particular, a possible salt body viewed via 29 lines of full stack 2D seismic data with OpendTect was compared against gridded free-air gravity anomalies using Geosoft's Oasis Montaj gravity modeling program. The analysis suggested that the pattern of strongly negative gravity anomalies may reflect Triassic salt delineated along the seismic line #21 that crossed a gravity minimum of -29.8 mGal. Given that the Laurentian Basin lies on a divergent margin setting analogous to the hydrocarbon rich Brazilian and Angolan margins, it will be of continued interest to the hydrocarbon exploration industry

.**Student Presenter:** Annabel Pinkney

Booth Number: 65

Research Mentor: Karl Whittington

Project Title: A Study in the Effectiveness of Expressing Geometric Theory Based on Illustration Media

Abstract: In the late 1400s, Leonardo da Vinci had ambitious desires to learn the theories of renaissance mathematics. He began an apprenticeship under Franciscan monk and mathematician Fra Luca Pacioli. During this time da Vinci drafted sixty drawings of polyhedra, of which fifty-nine were included in Fra Luca's book of geometry 'De divina Proportione.' The book was originally created in the form of a manuscript with each solid's image transferred directly from Leonardo's original drawings. Ten years later, the manuscript was converted into print form, and the images were printed into the incunabula via woodcut. The images are expressed now in two different media, but both seek to convey the same information While both the drawn objects and woodcuts may have been sufficient in conveying a general geometric overview of each polyhedron, the media may significantly affect the symbolic effect of the image on the reader Through a comparison of identical polyhedral illustrations present in the form of drawing and woodcut, I examined the ways in which images are used to aid in understanding and conveying knowledge and the effects of media type in achieving this aid. Based on this analysis, I argue that the choice of media does indeed have an effect on the reader's perception and ability to understand a given topic. I conclude that the manuscript illustrations are more effective in providing objective understanding of the dimensionality, formation, and geometry of the solids than the woodcut prints.

Student Presenter: Qinwan Rabbani

Booth Number: 66

Research Mentor: Vibhor Krishna

Project Title: DBSProcessor: An Automated, MATLAB-based Image Processing Pipeline for DBS-DTI Analysis

Abstract: Deep brain stimulation (DBS) is an effective treatment for neurological disorders (e.g. advanced Parkinson's disease). The electrical field generated by clinical DBS primarily stimulates the white matter tracts, potentially responsible for the clinical effects of DBS. Diffusion tensor imaging (DTI) is used to study these tracts in vivo, by modeling the diffusion properties of water molecules in the brain. Therefore, its incorporation into DBS research may improve the understanding of the substrate underlying therapeutic stimulation. The current software suites are often tedious and time-consuming command-line processes that can take days or weeks per patient, with constant monitoring. These processes can benefit from scripting, parallelization and GPU computing. With this goal in mind, we developed an easy-to-use, customizable, software package in MATLAB for DTI processing in DBS patients, "DBSProcessor." DBSProcessor offers pre-processing for artifact correction, coregistration plus normalization, stimulation simulation and individual and group-level connectivity analysis. This program utilizes custom MATLAB functions to integrate functions from other packages including dcm2nii (The Ohio State University, USA), FSL (University of Oxford, England), SPM (University College London, England) and Lead-DBS (Harvard University, USA), while providing pre-built, but highly modifiable processing routines for start-to-finish processing. To test this program, we processed de-identified images from 24 patients to explore the connectivity correlates of 550+ unique, clinically relevant stimulation changes in 15 pre-determined clinical domains. After non-stop processing for <200 hours, DBSProcessor successfully generated connectivity maps and statistics comparing effective versus non-effective stimulation. This toolbox could serve to greatly increase research throughput for DBS-relevant imaging analysis and reveal specific white matter tracts associated with stimulation induced clinical effects. In the long-term, it could help refine the surgical targeting and programming approach for DBS.

Student Presenter: Meredith Reagan

Booth Number: 67

Research Mentor: Per Sederberg

Project Title: Richness of experience and temporal accuracy for autobiographical memories: A lifelogging study

Abstract: There are many factors that could potentially contribute to our ability to remember an experience, one of which is how rich that experience was. Previous studies with a focus on lab-based memory tasks, such as memorizing photos or words, have provided some evidence for a relationship between the complexity or "richness" of a stimuli and the ability to accurately estimate when that stimuli occurred. However, like many experiments in the study of memory, these lab-based studies lack ecological validity that would generalize to real-world experience. The purpose of the present study is to examine the relationship between the richness of autobiographical events and judgments about when in time those events occurred. Our hypothesis is that the richer or more complex experiences should correspond to better memory for when the experience happened. Lifelogging, a technique in which someone wears a device that takes photos of his or her life, provides a way to collect autobiographical experiences to be used as future memory probes. In this study, participants wore an Android phone for 21 days, with the camera taking a photo every 30 seconds. After these three weeks, two experiments were administered to each participant: a Judgment of Recency task and Timeline task, which were administered while collecting EEG data. Data collection is still in progress, and we have a goal of 20 participants. The accuracy of the judgments of recency and the estimation of when the event occurred on three different time scales (week, day, and hour) will be used as a measurement of memory strength. To measure the richness of experience, we will use graph theoretical measures such as Lempel-Ziv complexity and correlation dimension. The results from this study will hopefully contribute to our understanding of how and why people remember real-world experiences from their own lives.

Student Presenter: Jennifer Rhoades

Booth Number: 68

Research Mentor: Ashley Felix

Project Title: The association between histological subtype of a first primary endometrial cancer and subsequent risk of second cancers

Abstract: Introduction: Histologic subtypes of endometrial cancer (EC) are etiologically heterogeneous and characterized by different survival outcomes. We examined the role of EC histologic subtype in development of second primary cancers (SPCs) using 9 Surveillance, Epidemiology, and End Results (SEER) population-based registries. Methods: Individuals diagnosed with a first primary EC between 1983 and 2013 were included, and SPCs were excluded if the second diagnosis was within two months of the initial EC diagnosis. We calculated standardized incidence ratios (SIRs) and 95% confidence intervals (CIs) for SPC risk among women with EC compared with the general population, overall and by histologic subtype. Results: This analysis included 88,138 EC cases, of which 11% (n=9,573) developed an SPC. Overall cancer incidence was significantly lower among women with EC than in the general population (SIR=0.92, 95% CI=0.90, 0.94). Increased risks of colorectal cancer (SIR=1.37, 95% CI=1.05,1.77), soft tissue cancer (SIR=1.33, 95% CI=1.03, 1.70), urinary system cancers (SIR=1.23, 95% CI=1.14, 1.32), and acute myeloid leukemia (SIR=1.29, CI=1.05, 1.57) while decreased risks of esophageal cancer (SIR=0.71, 95% CI=0.52, 0.96) and lung cancer (SIR=0.77, 95% CI=0.72, 0.81) were observed. Women with mixed-cell adenocarcinoma (SIR=1.30, 95% CI=1.09, 1.54) had the highest overall risk of SPC, while women with serous carcinoma had significantly elevated risks of soft tissue cancer (SIR=3.86, 95% CI=1.05, 9.88) and acute myeloid leukemia (SIR=2.41, 95% CI=0.66, 6.18). Conclusions: The risk of second cancer after EC differs by histologic subtype of the first primary and is particularly pronounced for those with serous and mixed-cell histological types. The underlying mechanisms of SPC following EC are unknown; we hypothesize that the aggressive nature of these subtypes and the preferred treatments for them are the causes for their increased risk.

Student Presenter: Katelyn Richardson

Booth Number:

Research Mentor: David Dean

Project Title: Production and Quantitative Characterization of Tissue Engineered Bone Extracellular Matrix on Resorbable Poly(propylene fumarate) Scaffolds

Abstract: The standard of care treatment for the reconstruction of segmental bone defects is the transfer (i.e., grafting) of autologous tissue which is associated with donor site morbidity, infection, in some cases insufficient donor tissue, and high cost.1 Previous work by the Osteo Engineering Laboratory has produced bone-like extracellular matrix (ECM) from bone marrow derived human mesenchymal stem cells (BM-hMSCs) on thin films and 3D printed scaffolds of the resorbable polymer Poly(propylene fumarate) (PPF).2 This project aims to develop and characterize bone ECM produced by BM-hMSCs (Bone Marrow-derived Mesenchymal Stem Cells) on a 3D-printed porous PPF scaffold. Scaffolds were pre-soaked in basal media + GTX to provide initial protein attachment, and then seeded at a density of 750 cells per mm2. Scaffolds were initially cultured in media with proliferation growth factors, and after 3 days growth factors were added to promote osteogenic differentiation. Biochemical assays (PrestoBlue®, Alkaline Phosphatase, and Alizarin Red S) were performed at each time point (i.e., days 1,3,7,14, and 21) to confirm that the mineralized coating was consistent with bone ECM. Additionally, micro-CT and SEM imaging was performed to visualize the ECM and to confirm that the samples were fully coated. Lastly, to further characterize the ECM, bulk mechanical compression tests were performed on the samples at each time point.

Our initial experiment showed poor BM-hMSC attachment. Therefore, we conducted a cell attachment study which showed that pre-soaking the scaffolds in 100% FBS, compared to our earlier pre-soak of basal media + RoosterBio (Frederick, MD) GTX, would result in a 30% increase in seeding efficiency. This experiment will be repeated using 100% FBS to validate the observed improvement of cell attachment. Assays such as nano-indentation, immunohistochemistry, histology, and qPCR will additionally confirm that the ECM produced by differentiated BM-hMSCs are expressing key bone-ECM markers.

Student Presenter: Alexandra Richey

Booth Number: 70

Research Mentor: Kazimierz Slomczynski

Project Title: Age, Place of Residence, Education and Perceived Sources of Success in Life in Poland, 1988 - 2013

Abstract: In stratification research, even that conducted in Eastern Europe, most examine objective determinants of privileged structural position, or what could be called, “success in life.” There is comparably little social psychological research in Eastern Europe on the determinants of what people believe are the factors that influence success in life – such as ambition, hard work, luck, or knowing the right people. This research is meaningful in the context of the huge ideological change from Communism to democratic capitalism that has occurred since 1989. I examine 25 years of the Polish Panel Survey (POLPAN 1988 to 2013) to investigate the effects of age, place of residence, and education on the perceptions people have about the sources of success. Using confirmatory factor analysis, I grouped sources of success into the categories of “meritocracy” which includes respondents’ evaluations of the importance of ambition, hard work, a good education, and talent and “friends/family” which includes evaluations of knowing the right people, political connections, coming from a rich family, and luck. I hypothesize that support for meritocracy would increase with years of education and would be stronger among both urban residents and the young. I also expect that support for the friends/family dimension would be strongest among the old. I employed multivariate regression analysis and found that, in all years, urban Poles perceive friends/family as less important for success. In every wave but 1993, as years of education increases, belief in meritocracy strengthens and in friends/family it weakens. In 1988, just before the end of Communism, the young did not believe that life is a meritocracy; afterwards, the relationship between being young and believing in meritocracy was not significant. Contrary to my hypotheses, in most waves, older Poles perceive meritocracy as a more important source of success in life.

Student Presenter: Erin Riddiford

Booth Number: 71

Research Mentor: Eric Johnson

Project Title: A Vernacular Trompe L'oeil: MS.MR.10

Abstract: Books of Hours were prayer books popular with the laity from medieval to early modern times. Modeled off the clergy's breviaries, they allowed the common people to pray the Hours of the Virgin on their own throughout the day, and were often richly decorated. The Ohio State University's Rare Books and Manuscripts Library houses a complete Book of Hours, MS.MR.10, dated to circa 1540 France, that features interesting iconography in its set of original images and a paste in added as a frontispiece in the 19th century. This paste in's addition to a medieval codex raises questions about why it was added and why the modern painter has attempted to copy medieval techniques in their portrayal of St. Peter, but has failed to emulate the style of MS.MR.10's original images. Of the original images, the cycle of evangelist portraits and a Madonna and child stand out. In the evangelist portraits, the authors are pushed up against the picture plane within framed spaces and two are depicted overlapping their frames. This causes the gospel writers to appear as if they are entering the viewer's space, in a similar fashion to figures in Renaissance window portraits. The Madonna and child features similar illusionistic techniques in which the frame surrounding the scene casts shadows on the interior. This pseudo-trompe l'oeil style may be influenced by the Ghent-Bruges School of book painting popular in the late 15th and early 16th centuries with elite patrons. While MS.MR.10's images attempt to create three dimensionality, they reflect a bastardization of the style in their unpolished rendering of figures. Through my exploration of the codex and analysis of its images in comparison to other examples, new insights will be found that can open discussion concerning vernacular Books of Hours that are often overlooked by scholarly research.

Student Presenter: Abubakarr Rogers

Booth Number: 72

Research Mentor: Mark Drew

Project Title: Investigating the antimalarial properties of purified compounds from the Madagascan plant, Cinnamosma fragnans

Abstract: Plasmodium falciparum, the most pathogenic human malarial parasite, has multiple life stages within the human host: primarily the asexual blood stages and the sexual blood stages which are transmitted to female Anopheles mosquitos. In order to treat and eradicate the parasite, novel anti-malarial therapeutics with both curative and transmission-blocking properties are required. Transmission of the parasite from the human host to the mosquito can be inhibited by killing gametocytes, inhibiting the process of gametocytogenesis, and/or preventing the formation of male microgametes. In this study, several in vitro assays were utilized to investigate the drug activity of six compounds purified from Cinnamosma fragnans, a Madagascan plant used as an antimalarial in traditional medicine. All six compounds were found to be potent against the asexual stages, with the most potent displaying an IC50 in the sub-micromolar range. Current studies indicate at least one of these compounds inhibits the process of gametocyte exflagellation, suggesting dual curative-transmission blocking activity.

Student Presenter: Ana Sandhu

Booth Number: 73

Research Mentor: Monique Pairis-Garcia

Project Title: Evaluating the effects of 3-nitrooxypropanol on feeding behavior in beef cattle

Abstract: 3-nitrooxypropanol (NOP), an inhibitor of methyl-coenzyme reductase, when supplemented in ruminant diets, decreases methane production produced in the rumen, resulting in an overall decrease in greenhouse gas emissions. Given the environmental benefits of such a product, understanding the mechanism behind how NOP decreases methane production is critical. One area of current research has focused on the impact of feeding behavior on methane production in cattle fed NOP. The objective of this study was to assess the overall effect of NOP on feeding behavior of cannulated beef cattle. A total of 9 beef cattle were housed in individual feedlot stalls and randomly assigned to one of three treatment groups; 1) Control (n= 3; control diet with water infused into the rumen), 2) Supplemented (n=3; NOP supplemented in diet and water infused into the rumen) and 3) Infused (n=3; NOPin; NOP infused into the rumen with a control diet). Feeding behavior (total feeding duration and the number of feeding bouts) was evaluated for two days in the pre-treatment period when all cattle were fed a control diet and two days in the post-treatment period when the treatments were implemented (total days= 4). Behavior was collected using continuous sampling methodology and feeding duration and bouts were collected. There were no differences in feeding time between treatments in the pre-period, however, all cattle, regardless of treatment decreased their feeding time in the post-period (P<0.0001). There were no differences in feeding bouts between treatments in the pre-period, however, all cattle, regardless of treatment increased feeding bouts in the post-period (P<0.0001). The results from this study suggest that treatment did not have an effect on feeding behavior duration or frequency of feeding, however there was a difference between pre and post treatment period among all cattle

Student Presenter: Gina Santi

Booth Number: 74

Research Mentor: David Dean

Project Title: 3D-Printing of Ceramic-Loaded Poly(Propylene Fumarate) Scaffolds for Bone Tissue Engineering

Abstract: The goal of this project is to 3D print resorbable, patient-specific poly(propylene fumarate) (PPF) scaffolds that incorporate ceramic materials for bone tissue regeneration. Bioglass can be added to PPF during printing to provide surface-located functional groups that can be used to attach ligands that promote osteogenic differentiation of bone stem cells. Cure tests (Mott et al., 2016) were used to determine if it is possible to 3D print PPF resin loaded with Bioglass. Samples with 0%, 1.25%, 2.5%, 5% and 10% Bioglass each cured successfully with little difference in thickness between groups after 5, 15, 30 and 60 seconds of UV exposure (390-405 nm). The optimal exposure time was between 15-30 seconds which yielded a thickness of 150-230 um, the ideal thickness for inter-layer stitching of 3D printed PPF scaffolds. No inadvertent curing was noticeable after the addition of Bioglass indicating that the light absorber, oxybenzophenone, in the resin had successfully prevented light scattering. However, it was observed that Bioglass settles very quickly in the resin suggesting the need for a dispersant. SEM images show that Bioglass was well distributed but in some cases formed clumps. Future work includes optimization of dispersant concentration relative to other resin components to reduce clumping and improve suspension of Bioglass in PPF resin, and 3D printing of scaffolds with increasing concentrations of Bioglass until the print fails as a measure of maximum ceramic concentration for printability in our EnvisionTEC (Dearborn, MI) Perfactory P3 3D printer. These successfully rendered (3D printed) PPF scaffolds will now be used for post-fabrication functionalization with short bioactive peptide decorations that can stimulate localized osteogenic differentiation of bone stem cells.

Student Presenter: Shruthi Sethuraman

Booth Number: 75

Research Mentor: Megan Ballinger

Project Title: Macrophage regulation of collagen and Î±-smooth muscle actin in fibroblasts

Abstract: Idiopathic pulmonary fibrosis (IPF) is a fatal disease characterized by excessive collagen deposition in the lungs which can lead to death caused by respiratory failure. There is no cure for IPF, and the average life span after diagnosis is 3-5 years. Fibroblasts, the main effector cell of pulmonary fibrosis, are responsible for producing the excessive collagen deposition in the lung. Recent work has described an important role for macrophages in regulating the development and propagation of pulmonary fibrosis. The purpose of this study is to examine crosstalk between fibroblasts and macrophages and elucidate the mechanism by which macrophages regulate collagen expression in fibroblasts.

Primary human fibroblasts were isolated and grown from normal, donor controls or explant tissue from IPF patients following transplantation and stimulated overnight with TGF-β ± PGE2. In addition, macrophages from normal, donor controls were also co-cultured with fibroblasts. Expression of fibroblast activation markers [collagen I, III and α-smooth muscle actin (SMA)] was assessed via qPCR and Western blot analysis.

Our data demonstrates that TGF-β stimulation elevates collagen expression whereas TGF-β + PGE2 treatment diminished expression of α-SMA. Interestingly, culturing fibroblasts with TGF-β and PGE2 resulted in higher gene expression when cultured with FBS rather than Human Serum. TGF-ß effects are not due to differences in receptor expression, as there was no difference in TGF-β receptors. However, there was a significant decrease in EP2 receptor in IPF fibroblasts which correlated with a reduced ability of PGE2 to inhibit collagen expression. Additionally, co-incubation of normal macrophages with fibroblasts from normal controls and IPF patients resulted in diminished collagen I and α-SMA. These data suggest a role for macrophages in regulating fibroblast activation in the setting of pulmonary fibrosis.

Student Presenter: Amy Sharn

Booth Number: 76

Research Mentor: Carolyn Gunther, PhD

Project Title: Project SWEAT - Healthy Eating Active Living Mapping Attributes using Participatory Photographic Surveys (HEAL MAPPS): A Qualitative Approach to Combating Unhealthy Weight Gain in Summer Months in Underserved School Age Children

Abstract: Introduction: During the summer months, children from low-income homes are at risk for unhealthy weight gain. Changes in the food and physical activity may be contributing to the problem. The objective of this study is to determine the environmental barriers and facilitators of children living in low-income, urban, neighborhoods for access to healthy food and active living during summer break.

Methods: Students in grades Pre-K-5th attending 2 Columbus City elementary schools located in low-income neighborhoods were invited to participate in the current study. The Healthy Eating Active Living Mapping Attributes using Participatory Photographic Surveys (HEAL MAPPS) protocol, which engages participants by using their smartphone-like device to identify facilitators and barriers to healthy living through images and mapping software, was utilized. HEAL MAPPS involves 4 contacts: 1) orientation to project and equipment training; 2) individual interview discussing images and routes taken; 3) focus group per school site discussing common experiences with neighbors/fellow MAPPers; and 4) local community stakeholder meeting to present images/findings and develop community action plan for each respective community.

Results: To date, 5 families have enrolled from participating elementary schools and mapped routes within their neighborhoods. Analysis of preliminary themes include: 1) poorly maintained walkways; 2) scarce accessibility to healthy, affordable foods; 3) multiple abandoned properties; and 4) unsafe activity near common neighborhood routes. Data collection is ongoing through summer and fall 2017 and data analyses are forthcoming.

Conclusions: This information may be used by local- and state-level stakeholders to improve neighborhood environments to promote healthy eating and active living during summer months.

Student Presenter: Sydney Sillart

Booth Number: 77

Research Mentor: Christopher Callam

Project Title: Synthesis of Quinone Methide Precursors as Acetylcholinesterase Reactivators

Abstract: Organophosphorus (OP) agents are responsible for the inhibition of the enzyme acetylcholinesterase (AChE). AChE is responsible for the hydrolysis of the neurotransmitter acetylcholine. OPs are covalent inhibitors of AChE and have been used as chemical warfare agents as well as pesticides. Without functioning AChE, acetylcholine accumulates and leads to serious adverse health effects, such as vomiting, paralysis, and even eventual death by respiratory failure. The magnitude of the effects and rate of death are determined by the OP's toxicity. There are known therapeutics, called pyridinium oximes, which can reverse the inhibition and reactivate AChE if administration occurs before aging. If left untreated, aging will occur, which is a dealkylation of the OP that is bound in the active site. Aging causes the OP to form a highly stable, charged alkyl phosphonate. There are currently no effective treatments to reverse the aging process, as aged AChE is unresponsive to reactivation by pyridinium oximes.

Our research focuses on synthesizing and testing small organic compounds that can hopefully re-alkylate the aged enzyme and enable it to be activated by pyridinium oximes. Quinone methide precursors (QMPs) are of particular interest because their structure resembles that of other molecules that are capable of binding to the active site of AChE. Furthermore, QMPs have been shown to have the ability to alkylate DNA, so they could potentially realkylate aged AChE as well. Their reactivity can be intensified by addition of other functional groups to their framework. Many libraries of QMPs have been synthesized, specifically libraries derived from different quinolone and isoquinoline frameworks. The aim is that one of these derivatives synthesized will be the key to realkylating aged AChE efficiently, and eventually lead to the reactivation of the enzyme. We will present multiple synthetic efforts towards the assembly of QMPs and screening assays with aged AChE.

Student Presenter: Benjamin Sipe

Booth Number: 78

Research Mentor: Harris Kagan

Project Title: Simulating the ATLAS Collider Using a Monte Carlo

Abstract: The research I am doing relates to the ATLAS Experiment. It is one of the experiments going on at the LHC in Geneva, Switzerland. The collider takes protons and smashes them together at very high speeds. When they collide a shower of debris flies out and is detected by the ATLAS detector. This machine was responsible for the discovery of the higgs boson in 2012. What I am doing involves simulating these collisions with a computer program. The program will generate points that fall within the probability for the angular distribution of the debris from a W boson collision. The W boson decays into a neutrino and a lepton so, the angular distribution will represent where those particles fall on the detector. I will make 3 different distributions to determine if one type of collision creates a W boson more often than another. The main purpose of this project is to get me to learn everything I need to contribute to the ATLAS group here at OSU. The project may take 9 months from the start so it may not be 100% complete at the time of the Undergraduate Research Forum. To create this program I used a data analysis framework created by CERN called ROOT. The type of program I am making is called a monte carlo which generates random sets of points. If the points fall underneath the probability curve, I keep the point, otherwise I reject it. For example, I can make a cosine distribution by making my y-axis the probability of getting a certain x. Let's say the probability of getting an x is 70%, then I only keep 70% of the x's I get. I sort these x's into bins and the resulting histogram should be a cosine distribution. The same applies to the angular distribution I will make. All of the data will be gathered in the CM frame and will be transferred to the lab frame via Lorentz Transformations. In general programs that simulate the colliders are important because they tell us what we should expect, if reality differs from those simulations then, maybe they made a new discovery.

Student Presenter: Madison Smith

Booth Number: 79

Research Mentor: Zucai Suo

Project Title: Kinetic Investigation of the Bypass and Extension of a Bulky Lesion by Human DNA Polymerase Kappa

Abstract: Genomic DNA is constantly exposed to endogenous and exogenous chemical agents which can damage DNA bases by modifying their molecular structure. Such modifications, termed DNA lesions, cause significant problems during DNA replication including stalling of replicative DNA polymerases and erroneous DNA replication, the latter of which is a major source of DNA mutations that may potentially lead to diseases such as cancer. 3-Nitrobenzanthrone (3-NBA), a small, cyclic hydrocarbon produced by the incomplete combustion of diesel fuel, is metabolized in the body and reacts with DNA bases to form bulky DNA lesions such as N-(2'-deoxyguanosin-8-yl)-3-aminobenzanthrone (dGC8-N-ABA). Accordingly, this lesion can stall normal replicative DNA polymerases and must be bypassed by specialized Y-Family DNA polymerases to avoid cell death. Y-Family DNA polymerases are uniquely able to accommodate bulky DNA lesions and can perform translesion DNA synthesis by continuing DNA replication in place of stalled replicative DNA polymerases. Our previous studies have shown that two human Y-family DNA polymerases, eta (hPolη) and kappa (hPol), were able to efficiently replicate a small DNA molecule containing a dGC8-N-ABA lesion in vitro. Here, we used pre-steady-state kinetics to investigate the efficiency of hPol during bypass, or nucleotide incorporation opposite dGC8-N-ABA, and during extension of either matched or mismatched lesion bypass products. We performed single-turnover assays to determine pre-steady-state kinetic parameters for maximum nucleotide incorporation rate constants and nucleotide binding affinities to determine the efficiency of correct and incorrect nucleotide incorporation by hPol. During dGC8-N-ABA bypass and matched base extension, hPol incorporated correct nucleotides, 116- and 786-fold, respectively, less efficiently than with the undamaged DNA substrate. During mismatched primer extension (i.e. dG:dGC8-N-ABA, dT:dGC8-N-ABA, dA:dGC8-N-ABA), hPol incorporated the correct nucleotide with similar efficiency to the correctly matched base-pair (dC:dGC8-N-ABA). Our results indicated that indeed hPol likely fulfills a role during the bypass and/or the extension of matched or mismatched base pairs during TLS of dGC8-N-ABA.

Student Presenter: Emily Teets

Booth Number: 80

Research Mentor: Sharon Amacher

Project Title: The fast muscle myosin light chain mylpfa is essential for fast muscle function and integrity

Abstract: Muscle fibers are long multinucleate cells containing contractile proteins organized into units called sarcomeres. To produce different levels of contractile strength and endurance, muscle fibers express proteins that modulate contractile function, such as myosin light chains. The function of such modulatory proteins was studied previously in vitro and in vivo using mouse and Drosophila models; however, the developmental roles of myosin light chain genes have not been closely examined, nor have the specific functions of the four zebrafish fast muscle-expressed myosin light chain genes been characterized. Using CRISPR-mediated mutagenesis, we created null mutations in three zebrafish myosin light chain genes: myl1a, mylpfa, and mylpfb. Although myl1a and mylpfb mutants appear normal, homozygous mylpfa mutants are weak and contract slowly compared to WT siblings. We hypothesize that mylpfa is necessary for normal sarcomere formation, and thus muscle function, but is dispensable for muscle fiber formation. Consistent with our hypothesis, fast muscle fibers with abnormal sarcomeric structure form in mylpfa mutants. In contrast, mylpfa mutant slow fiber sarcomeres appear normal. Muscle function in mylpfa mutants is differentially affected depending upon myofiber composition. The pectoral fin, composed primarily of fast fibers, is paralyzed, whereas the trunk musculature, comprised of both fast and slow fibers, is still contractile. Between 3 and 4 days post fertilization, fast fibers in both the fin and trunk degenerate in mylpfa mutants, indicating that while mylpfa is dispensable for initial fast fiber formation, it is essential for fast fiber integrity. The discovery that mylpfa is essential for normal sarcomere formation and fiber integrity was unanticipated since previous work focused on the role of mylpfa function in tuning muscle function. Further investigation into how mylpfa functions in sarcomere assembly and how sarcomere assembly influences fiber integrity may help explain degenerative muscle diseases, particularly myopathies caused by mutations in sarcomeric proteins.

Student Presenter: Noelle Thompson

Booth Number: 81

Research Mentor: Millie Harris

Project Title: Adressing Food Insecurity Screening Feasibility and Barriers

Abstract: Background & Objectives Food insecurity is the measure of lack of access, at times, to enough food for an active healthy life for all household members and limited or uncertain availability of nutritionally adequate foods. Food insecurity has been an ongoing health problem. Due to small changes in income, transportation, expenses, access to assistance, food security status of families can change rapidly making this a complex issue. 21% of US Children are food insecure. Nationwide Children's Hospital (NCH) previously had no systematic approach to identify food insecure patients. Methods/Analysis To address food insecurity, NCH implemented food insecurity screenings at 12 NCH Ambulatory Centers over an eight week period to evaluate feasibility, measure outcomes of screened patients, and identify food security barriers. Screenings were given per family (household measure) by trained ambulatory interns at each site. Screenings consisted of two validated questions, patient demographic and food security barriers information. Positive status was determined if a patient answered anything besides "never true" to the two validated questions. All patients who screened positive were given a resource sheet following patient participation. After 30 days, follow up calls were made to all patients who screened positively to revisit food security barriers. Ambulatory Interns completed an online assessment after each screening session in order to evaluate challenges during screening session, highlighting the number of patients missed as well as the quantity and type of interpreter services needed. Results & Discussion Even though the Franklin County food insecurity rate is 16.8%, approximately 55% of all patients screened identified as being food insecure. Significant differences (p<0.05) in food insecurity rates were found in terms of education level, insurance types, health literacy, and race. NCH will be using this information as a better way to provide resources to their patients and in the ongoing efforts to better address social determinants of health.

Student Presenter: Salam Tiba

Booth Number: 82

Research Mentor: Carolyn Gunther

Project Title: Reliability and Validity of the Expanded Food and Nutrition Education Program (EFNEP) Nutrition Education Survey

Abstract: Background: There is need for valid and reliable tools to assess nutrition and physical activity outcomes in low-income, racial minority children and families who are at increased risk for poor health behaviors and obesity.

Methods: Students in grades pre-K-5th at public elementary schools participating in a larger observational study located in low-income neighborhoods of Columbus, Ohio were invited to participate in the current study. Data will be collected from participating children at three time points – beginning (b0) (completed) and middle (t1) of summer, and at the beginning of the following school year (t2). Dietary intake and physical activity behaviors will be assessed with three 24-hour dietary recalls and Garmin VivoSmart HR activity trackers , along with the EFNEP NES. Construct validity will be assessed using Pearson correlation tests comparing EFNEP survey questions to dietary intake (three 24-hour dietary recalls) and physical activity (Garmin VivoSmart HR) data. Reliability will be assessed using Cronbach's Alpha tests for internal consistency.

Results: 62 children representing 42 families enrolled. Mean age was 6.96 ± 0.33. 83.8% reported being Black, and 69.4% were low-income. Preliminary reliability testing indicates acceptable reliability of the survey with an alpha coefficient of 0.75 for all survey items and alpha coefficients of 0.67, 0.60, and 0.63 for the nutrition, food safety, and physical activity constructs, respectively. Upon completion of t1 and t2 data collection, results will be analyzed for final reliability and validity testing.

Conclusions: Preliminary data suggest that the EFNEP Nutrition Education Survey may be a reliable survey for reporting child nutrition and physical activity behaviors.

Student Presenter: Jake Tischler

Booth Number: 83

Research Mentor: Joshua Dubrow

Project Title: Social Class and the Perception of Conflicts between Economic and Political Groups in Poland, 1988 - 2013

Abstract: Social conflicts and the perception of these conflicts have major consequences. The rise of populism around the globe is rooted, in part, in the perception of social conflicts between opposing economic and political groups. Karl Marx and Friedrich Engels, whose ideas became the basis of the Communist revolution in the 20th Century, argued that class conflict drives society and therefor, drives history. But what drives conflict? This paper aims to answer that question, or more specifically, is there a significant relationship between an individual's social class and their perception of conflict between economic and political groups, between the fall of Communism in 1989 and the near present? I hypothesized the following; during the early post-Communist period 1993 - 1998, disadvantaged social classes will perceive greater levels of social conflict between economic and political groups than privileged classes; during the later post-Communist period, 2003 – 2008, the gap between classes in conflict perception would decrease; in 2013, after the economic crisis and in the nascent period of growing populism in Poland, the gap in class differences will widen. Data was accumulated from each wave of POLPAN, a representative sample of Poles interviewed and re-interviewed every five years from 1988 to 2013. Multivariate regression was used in order to determine which, if any, independent variables had a significant effect on the dependent variable. The results of the analysis proved inconsistent but not insignificant. Respondents' social class often had a significant impact on their perception of economic conflict, but it was not consistent with the original hypotheses. Further studies are necessary as POLPAN gathers new data and respondents change. It is important to continue to study not only perceptions of conflict, but what causes them as well, because it is these perceptions that can shape elections and governments for years to come.

Student Presenter: Allison Walker

Booth Number: 84

Research Mentor: Adrienne Dorrance

Project Title: Elucidating the Role of Long Non-Coding RNA DANCR in Leukemic Stem Cells (LSC)

Abstract: Acute myeloid leukemia (AML) is a malignant disease associated with poor outcomes. The leukemic stem cell (LSC) model postulates that AML consists of heterogeneous cell populations. The LSC subpopulation, essential for leukemia maintenance, is resistant to chemotherapy, resulting in disease relapse. Pharmacological targeting and eradicating LSCs is crucial to improve patients' outcome. LSCs host long non-coding RNAs (lncRNA) which are longer than 200 nucleotides and regulate several cellular functions. AML patients (n=377) were analyzed for Stem Cell-Like Core Enriched (CE) Gene Expression Signatures, comprising 44 genes activated in LSCs, and correlated with lncRNA expression profiles. 161 lncRNAs were found to significantly deregulate in patients with CEhigh expression (p<0.001). DANCR was one lncRNA found to be higher expressed in AML patients with CEhigh scores. Previous studies showed that DANCR promoted stemness in hepatocellular carcinoma (HCC) by modulating WNT pathway. To validate our RNA-seq analysis, qRT-PCR was performed to evaluate DANCR expression in AML patients' bone marrow and was found to be significantly elevated compared to healthy donors (n=3; p=0.01). Using siRNA loaded nanoparticles, we performed a DANCR knockdown in primary CD34+ AML patients (n=3). Colony forming assays on KD cells showed significantly fewer colonies compared to scramble control after replating (p=0.03, average decrease: 38.9%) This indicates an impact of DANCR on LSC self-renewal capacity. CellTrace Violet assays showed significant decreases in quiescent CD34+ cells after DANCR knockdown. Long Term Culture Initiating Cell (LTC-IC) assays revealed a significant decrease of LSC frequency after KD. Our data identified a LSC-specific lncRNA profile. DANCR, a lncRNA we identified, demonstrates a role in LSC self-renewal capacity, frequency, and quiescence in AML patients. This is the first report of a lncRNAs' role in regulating LSC functions. Evidence for DANCR as a potential therapeutic target to eliminate LSCs is shown in the hopes of complete eradication.

Student Presenter: Logan Walker

Booth Number: 85

Research Mentor: Ralf Bundschuh

Project Title: Gene Expression Analysis at the Ultralow RNA Input Levels

Abstract: In recent years, RNA-seq has been the tool of choice for determining gene expression in biological samples. As the field matures, library generation approaches coupled with model-based data analysis pipelines allowed the profiling of ultralow RNA input amount down to a single cell. This approach necessitates the pre-amplification of input RNA. Current methods allow direct amplification of RNA from single cells or from as little as 10 pg of extracted RNA. This process can result in substantial systems noise rendering between group comparisons difficult. To study this, we had sequenced RNA-seq libraries using SMARTer v4 protocol from FACS-sorted CD5+ and CD5- CLL patient cells. For each cell type, we examined data from input amount of 10-, 100-, and 1000 pg, all from a single RNA aliquot. This study design reveals the structure of systems noise associated with varying RNA input amounts or cells. In summary, we noted that cDNA profiles from a single RNA aliquot were different, depending on input amount: i) 1000-pg input: cDNA length >10kb; 11 PCR cycles; ii) 100-pg input: length <10kb; 15 PCR cycles; iii) 10-pg input: length = 2 – 7kb; 18 PCR cycles. The number of differentially expressed genes (FDR-corrected p <0.05) between the cell types were as follows: 1000-pg (588), 100pg (25), and 10-pg (1,372). Importantly, we noticed the unique presence of low-count DEGs at the 10-pg input and hypothesize that the ratio of pre-amplification reagent to templates are higher in 10-pg samples, resulting in amplification of more low- and single-copy transcripts. These transcripts, being lowly expressed, are prone to variability. The presence of false DEGs contributes to high level of systems noise by ultralow input samples. By modeling coverage distributions along detected transcripts, we can determine high confidence transcripts for subsequent DEG analysis.

Student Presenter: Skyler Ware

Booth Number: 86

Research Mentor: Robert Baker

Project Title: Improved stability of a C-C bond coupling catalyst for CO2 reduction using O2 as a sacrificial electron acceptor

Abstract: The electrochemical conversion of carbon dioxide to value-added, multi-carbon products has been extensively studied as a pathway to renewable fuel sources as well as an alternative to current carbon capture and storage methods. Delafossite copper iron oxide films selectively catalyze the reduction of carbon dioxide to acetate (a high energy density fuel source) with little to no overpotential. However, the catalyst is not stable under illumination and deactivates after approximately ten minutes. Previous studies have shown that the catalyst deactivates following the reductive dissolution of surface iron species. The addition of gaseous oxygen as a sacrificial electron acceptor prevents the reductive dissolution of iron under both illuminated and dark conditions and stabilizes the catalyst for several hours; however, excess oxygen scavenges the electrons used for acetate production, resulting in lower product yield and reduced conversion efficiency. The purpose of this study was to determine the optimum oxygen flow rate to maximize acetate production while minimizing catalyst deactivation. An electrolyte solution was purged with both carbon dioxide and oxygen before and during electrolysis using the copper iron oxide catalyst as the working electrode. The carbon dioxide flow rate was held constant at 13sccm, while the oxygen flow rate was varied from 0 to 450sccm over several trials. Acetate production was quantified by 1H-NMR spectroscopy, and the post-reaction catalyst was characterized by XPS, ICP-MS, and SEM/EDX imaging. It was determined that an oxygen flow rate of 360sccm significantly slowed iron reduction and stabilized the catalyst for up to 12 hours with only a modest drop in acetate selectivity. This enhanced stability will allow further examination of the surface chemistry of the catalyst over long-term reductions, including the mechanism of acetate production and the role of both metals in the catalytic process.

Student Presenter: Keyante Watkins

Booth Number: 87

Research Mentor: Ryan Heitkamp

Project Title: Soul Train 2017: Joy, Love & Soul

Abstract: Over the summer I directed, wrote, produced and choreographed my first production on my own. The production was called Soul Train 2017: Joy, Love & Soul. It was a dance theatre presentation that I put a lot of time and energy into which consisted of dancing , acting, singing and poetry from 36 youth and young adults from the city of Columbus, OH and The Ohio State University. We had two shows on July 2, 2017! We had a show at 3:30 and another at 7pm. We sold out both shows as we had a standing ovation during the performance and after the performance. Our production took a lot of notice in the City of Columbus, OH and that pushed me to officially get my business license , EIN and to make my Performing Arts company official. I am currently in the process of searching for a studio for all of the youth and young adults in the city of Columbus, oH but mostly for urban performers that need the arts as an outlet.

Student Presenter: Tirzah Weiss

Booth Number: 88

Research Mentor: Sung Ok Yoon

Project Title: Role of urinary proNGF in TrpV4 function of the urothelium.

Abstract: NGF signaling mechanisms have been a focus for treating various urological conditions, such as overactive bladder and interstitial cystitis (IC)/painful bladder syndromes (PBS), as they are known to contribute to bladder hyperactivity. In particular, an increase in NGF levels was reported in urine after spinal cord injury (SCI) as well as in overactive bladder and IC/PBS. We discovered that of the NGF species, proNGF was detected in the urine from mammals to humans after spinal cord injury. The urinary proNGF appears to signal through p75 on the lumen lining urothelial cells, inducing apoptosis after SCI. Deleting p75 and blocking proNGF from binding to p75 blocked their apoptosis completely. Surprisingly, selective deletion of p75 in the urothelium altered urodynamics with increased voiding frequency with reduced inter-micturitional intervals in naïve mice. These data are opposite to what was reported for TrpV4 knockout mice, which showed reduced voiding frequency with increased inter-micturition intervals in naïve conditions. TrpV4 is one of the Trp family of receptors that is expressed in umbrella cells as well as the intermediate and basal cells of the urothelium. TrpV4 expression in the urothelium was shown to increase when NGF was genetically increased in the urothelium, suggesting a possible functional link. We hypothesize that p75 signaling counteracts TrpV4 signaling in the urothelium. The hypothesis was tested in primary mouse urothelial cells that express TrpV4 and respond by increasing calcium influx to agonist addition. In response to its selective agonist, GSK1016790A, Ca2+ flux was increased, which was dependent on extracellular calcium. Preincubation with 10 ng/ml proNGF 10 min. prior to GSK1016790A addition attenuated the Ca2+ flux significantly, suggesting proNGF signaling antagonizes TrpV4 activation by GSK1016790A. In support, GSK1016790A-mediated Ca2+ flux was also reduced in p75KO urothelial cultures. We thus conclude that proNGF-p75 signaling in the urothelium contributes to the micturition responses.

Student Presenter: Clay White

Booth Number: 89

Research Mentor: Amanda Simcox

Project Title: Identify RPR regulatory region in ostracod Heterocypris incongruens

Abstract: Ribonuclease P (RNase P) is an essential endonuclease involved in cleaving the 5' leader of pre-tRNA molecules before they can take part in translation. RNase P is a ribonucleoprotein complex with the RNA as its catalyst and is conserved in all three domains of life. The catalytic component of this enzyme, RNase P RNA (RPR), is transcribed as an independent gene in all animals studied so far. However, our lab showed that in insects and crustaceans the RPR gene is embedded in an intron and is transcribed as part of an mRNA of another protein coding gene. This switch in the RPR transcriptional control has occurred approximately 500 million years ago in a common ancestor of insects and crustaceans. Although there are many species of insects and crustaceans that confirm this timeline of transcriptional change, there are still a few clades for which the genome sequence is unknown, including ostracods. By identifying the RPR regulatory region in ostracods species, we will have a better idea when the transcriptional switch occurred from RPR being an independent gene to a gene processed from within an intron. My goal is to construct the sequence surrounding the RPR gene in ostracod Heterocypris incongruens and analyze the flanking region to identify the mode of transcription. Classifying the manner in which RPR is transcribed will give us a more accurate phylogenic placement in history of when the switch happened.

Student Presenter: Vilas Winstein

Booth Number: 90

Research Mentor: Ghaith Hiary

Project Title: A new formulation for computing the Riemann zeta function

Abstract: The Riemann zeta function is an important function in Number Theory, and is central to the Riemann hypothesis, which is considered one of the greatest unsolved problems in mathematics. I am implementing a new method for computing the Riemann zeta function with very high accuracy.

The Riemann zeta function is defined by an infinite series and so cannot be numerically evaluated exactly for all input values. Current methods for computing the zeta function include the Riemann-Siegel formula which is fast and gives a good general approximation but has limited accuracy. There are also methods (such as the Euler-Maclaurin formula) which are provably very accurate, but are very slow for large input values. The method I am implementing is a new formula that is comparatively fast for large input values and doesn't suffer from limited accuracy.

The ability to compute values of the Riemann zeta function efficiently is significant, as it gives a way to approximate the zeroes (input values for which the Riemann zeta function is zero, the subject of an active area of research) via the Intermediate Value Theorem.

The new formula was discovered by Dr. Ghaith Hiary, and while the theoretical details are available in his paper, much work was and is still needed to ensure that the formula is useful. The details in the paper do not immediately enable a practical implementation on a computer system, so I have been working alongside Dr. Hiary to implement and optimize the formula to run on various computer systems.

Student Presenter: Elizabeth Woods

Booth Number: 91

Research Mentor: Kazimierz Slomczynski

Project Title: Social Structure and Social Capital in Poland over Twenty Five Years

Abstract: Data was used from POLPAN, to quantify and use in various statistical methods. POLPAN, being a national representative panel survey, provided information on social structural position and social capital along with other topics. The population represented in the survey was respondents ages 21 to 65 over every 5 years since 1988, thus giving a comprehensive look at the influences of post-Communism over a long period of time.

The results that advantaged social structural position in terms of social class positively influences the size and quality of social capital. This is true for the portion of the hypothesis that relates to size of the social capital. Although there is a positive relationship between social position and number of friends, the significance of the relationship differs from one year to another. This implies that though, that if there is an increase in social position, than the number of friends will likely increase. The opposite results occurred for frequency of contact. So, therefore, as social class increases the number of friends that a respondent has will generally increase, but the frequency of contact that the respondent has with their social network will decrease.

For an increase in religiosity can decrease the size and quality of social capital, the results varied. For frequency of contact, or the depth of a respondent's social network, having an increase in religiosity can, slightly, decrease the size and quality of social capital. As I had results that both were negative and positive relationships, this indicates that the church doesn't influence results in a strong way. Post-Communist Poland has been an ever-changing country, which influences the lives and social structure of its citizens. By studying social capital through POLPAN, a unique view of the depth and quantity of respondent's social networks can be viewed.

Student Presenter: Jingyuan Wu

Booth Number: 92

Research Mentor: Justin Diles

Project Title: Architectural Origami: Folding Structure, Space & Surface

Abstract: This project explored the potential of origami—paper folding—to inform the production of contemporary architectural structures, spaces and surfaces. The project had both a research and design phase; the first phase investigated the latest computational methods for generating and simulating three-dimensional folded structures, and the second phase applied this research to the development of several building designs for Medini, a new city in Malaysia located adjacent to Singapore.

Phase One

Origami-based designs consist of 3D forms that can be “unfolded” into flat, 2D templates. Our main software for simulation, “Freeform Origami” by Dr. Tomohiro Tachi of The University of Tokyo, is able to test a crease pattern with a physics simulator to determine how it might behave as a kinetic or deployable structure. To explore the possibilities of origami in architecture, our efforts fell into two related categories: deployable (“kinetic”) origami forms that make buildings responsive; (“static”) origami forms for structural surfaces.

Phase Two

Medini is 2,300 acres (9.3 km2) and planned for a population of 350,000 by 2030. Our project focused on the northernmost district which is the home to the city hospital. Our building and landscape designs create a series of themes for "medical tourism", which combines tourism and medical treatments to get the best effect. The Mountain Bath, in specific, provides a dramatic interior equipped with multiple baths and therapy areas for both visitors and citizens. The exterior form is generated from a single, flat sheet using the principles of origami. A triangulated pattern assigned to the surfaces of the mass was thickened and made structural using the advanced algorithms of the “Freeform Origami” program. Deployable shingles were then embedded into this pattern to control how reflected light enters the large volume of the baths.

Student Presenter: Zan Xu

Booth Number: 93

Research Mentor: Chien-liang Lin

Project Title: Investigating increased glutamate transporter EAAT2 expression as a potential therapeutic approach for Gulf War illness

Abstract: Gulf war illness (GWI) is a chronic and multisymptomatic disorder afflicting veterans who served in the Persian Gulf War. Although the exact cause of GWI is unknown, combined exposure to i) nerve gas drug pyridostigmine bromide, ii) pesticides, DEET and permethrin, and iii) war-related stress has been proposed as the foremost cause of GWI. Mood and memory deficits are common symptoms in GWI patients. In light of previous literature, we hypothesized that chronic exposure to GWI-related chemicals and stress causes an increase in extracellular glutamate levels leading to hippocampal damage and subsequent cognitive and mood deficits. In the present study, we investigated if enhanced glutamate uptake function by increased expression of the glutamate transporter EAAT2 could ameliorate cognitive and mood deficits. A small molecule LDN/OSU-215111 which can increase EAAT2 expression was used in the study. To generate GWI-like conditions, 3-4 month-old C57BL6 mice were exposed to GWI-related chemicals and unpredictable stress daily for six weeks. Mice received either compound or vehicle daily during these six weeks. At 3-months post-exposure, mice were subjected to several behavior tests to assess mood and cognitive functions. These tests included open field,Â tail suspension (TST),Â light and dark exploration (LDE), elevated plus maze (EPM), Barnes maze (BM), and novel object recognition (NOR). The results showed that anxiety-like behaviors in LDE and EPM were reduced in the compound-treated group. Depression-like behaviors in TST were also reduced in compound-treated mice. Finally, compound-treated mice also demonstrated improved cognitive functions as indicated by BM and NOR tests. Our current data suggested that our compound has beneficial effects in the GWI mouse model.

Student Presenter: Gen Xu

Booth Number: 94

Research Mentor: Chris Pierce

Project Title: Beads as Probe of Magnetic Structure

Abstract: Ferromagnetic materials such as a compass, have a North and a South pole. It is easy to tell which end is the North or the South pole, but if we go to a micro scale, it is found that the dipole is contributed by different domains of the magnet, where each domain has a uniform direction inside, but different domains point to different direction. Their overall contributions form a macro scale direction, that is, the North and the South. However, determine how those domains and their boundaries distribute is not easy. The popular way to do this is using Magnetic Force Microscope, while it costs millions of dollars, easy to be broken, and has strict environmental requirements. As with all of these drawbacks, we figured a new method to observe these magnetic structures. In this research project, we use super para-magnetic beads as our probe, which will bring a resolution of magnetic structures up to 50 nano meters as provided by the size of the magnetic beads. Under a microscope, those beads are placed onto a 2-D magnetic thin film, which has the magnetic structures that we want to look at. By applying an external magnetic field, the magnetic potential energy is changed and those magnetic beads will move over the magnetic film according to the distribution of the potential energy traps, just like a ball rolling over mountains. By observing the movement modes of those magnetic beads, we will be able to derive the distribution of the magnetic structures with the external field records. Due to the small magnetic field exerted, the sample won't be destroyed, which is another advantage relative to the traditional way.

Student Presenter: Ryan Yoder

Booth Number: 95

Research Mentor: Wendy Xu

Project Title: Medication assisted treatment capacity variations for states

Abstract: The current opioid epidemic is affecting millions of Americans, with the number of overdose-related deaths tripling in the past decade. Access to opioid treatment for people with substance use disorder allows them an opportunity to seek help for their addiction. Medication-assisted treatment (MAT) is becoming a popular method of treatment; combining behavioral therapy and medication. The Medicaid expansion option under the Affordable Care Act allowed some states to expand coverage and improved utilization of MATs. There is evidence that states that expanded their Medicaid program had more prescriptions and spending on buprenorphine, an MAT drug. However, physician capacity to prescribe MATs are rarely touched upon in the literature, even though it is a large factor in increasing access to care. The purpose of this study is to explore physician capacity variations among states that expanded Medicaid to states that did not. Using data from the Substance Abuse and Mental Health Services, the number of opioid treatment programs and physicians with specific waivers to prescribe MATs were counted and standardized by population. For states that expanded Medicaid, the quantity of opioid treatment programs were 5.17 per 1,000,000 residents compared 3.89 per 1,000,000 residents in non-expansion states. Expansion states also have a higher volume of physicians who have obtained special waivers to prescribe MATs, with 20.84 per 1,000,000 physicians in expansion states and 11.28 per 1,000,000 in non-expansion states. These variations were also tracked on the state level. This preliminary data that the study is expanding on demonstrates the impact policies have on the opioid landscape. The Affordable Care Act and the MAT waiver law are examples of how policy shapes physician capacity and can effect how this opioid epidemic is handled and data should be collected to ensure peoples' health are benefiting from the laws that are passed.

Student Presenter: Sergio David Zapeta Tzul

Booth Number: 96

Research Mentor: Aurel Stan

Project Title: Log-concavity of the Holder means and an application to Geometry

Abstract: The log-concavity of the Holder means for two positive numbers is presented first. The log-concavity inequality is sharp and requires differentiating a function three times. Then the log-concavity of the Holder means is used to find the best index p of the Holder mean, such that the p-Holder mean of two sides of any triangle is greater than a certain cevian starting from the vertex that is common to two sides of the triangle. Particular examples of cevians include the: medians, bisectors, and simedians.