Mid-Michigan Symposium For Undergraduate Research Experiences

Michigan State University

JULY 24, 2018

WELCOME

Thank you for attending the 2018 Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE) at Michigan State University. Our goal is to provide a forum for undergraduates in the region to share and discuss their research as well as create networking opportunities with graduate schools and researchers.

Undergraduate students from diverse academic disciplines will present their outstanding research and creative endeavors at Mid-SURE. Approximately 350 students from more than 100 different institutions are participating in today's event. These students are mentored by more than 400 faculty members, post-doctoral researchers, and graduate students.

As one of the nation's leading research institutions, MSU offers a breadth of experiences and opportunities that actively engage students in their education. Through undergraduate research and creative activities, students work closely with leading scholars to gain in-depth knowledge about their fields of study and have opportunities to apply classroom learning to real-life situations.

We encourage the student participants, faculty members, research mentors, and guests to walk around the forum and learn about the impressive work of our next generation of scholars and researchers. Thank you for joining us.

MID-SURE PLANNING COMMITTEE

Lizzy King
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Elahé Crockett
REPID Program Director

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Program Manager, The Graduate School

Cover image designed by Matthew Gillespie

UNDERGRADUATE RESEARCH AT MSU

MSU UNDERGRADUATE RESEARCH INITIATIVE

Michigan State University's **Undergraduate Research Initiative** strives to increase opportunities for students to engage in research, scholarship, and creative activity and expand the pool of faculty and partners engaging students in their scholarly work. The Undergraduate Research Office annually disperses undergraduate research grants, sponsors professional development workshops, awards undergraduate research travel grants, and creates materials to promote undergraduate research. The office sponsors two undergraduate research forums annually: the University Undergraduate Research and Arts Forum (UURAF), held each April, and Mid-SURE, held each summer. For more information about MSU's undergraduate research initiative, visit urca.msu.edu.

PARTNER PROGRAMS

Mid-SURE is a collaborative effort between the Undergraduate Research Office, BEACON, EnSURE, REPID, and SROP. Program descriptions and contact information are provided below.

BEACON

The **BEACON Center for the Study of Evolution in Action** approaches evolution in an innovative way, bringing together biologists, computer scientists, and engineers to study evolution as it happens and apply this knowledge to solve real-world problems. BEACON is an NSF Science and Technology Center, headquartered at Michigan State University with partners at North Carolina A & T State University, University of Idaho, University of Texas at Austin, and University of Washington. For more information about undergraduate research opportunities in BEACON, contact Dr. Judi Brown Clarke, Diversity Director, at jbc@msu.edu.

ENGINEERING SUMMER UNDERGRADUATE RESEARCH EXPERIENCE

The Michigan State University College of Engineering sponsors **EnSURE,** which is designed to engage high achieving students in faculty-mentored research. Students are paired with faculty in one of eight engineering departments and engage in 10 weeks of full-time research activities, ranging from "bench science" in a laboratory to on-site fieldwork and computational modeling. Students are exposed to a variety of research activities and participate in weekly professional development activities designed to help students understand and prepare for graduate studies. For more information, contact Dr. Katy Luchini Colbry, Director of Graduate Initiatives and Coordinator of EnSURE, at colbryka@msu.edu.

REPID PROGRAM

The **Research Education Program to Increase Diversity in Health Researchers (REPID)** program provides research training and enrichment experience for MSU undergraduate, graduate, and medical health professional students from underrepresented, minority, and disadvantaged groups. The program aims to increase the number and diversity of researchers in health-related research by providing a supportive environment for accomplishment and advancement with the goal of preparing students to pursue research careers in cardiovascular, pulmonary and hematologic disciplines. REPID is funded through support from the National Heart, Lung, and Blood Institute. For more information, contact Dr. Elahé Crockett, Program Director, at repid@msu.edu, or visit www.repid.msu.edu.

SUMMER RESEARCH OPPORTUNITIES PROGRAM

The **Summer Research Opportunities Program (SROP)** is a gateway to graduate education at Michigan State University. The goal of the program is to increase the number of domestic under-represented students who wish to pursue graduate study. The program helps to prepare undergraduate students for graduate study through intensive research experiences with faculty mentors and professional development activities that give students a competitive advantage. For more information, contact Steven D. Thomas, Program Manager at the Graduate School, at deshawn@grd.msu.edu.

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SCHEDULE OF EVENTS

All events occur on the 4th floor of Spartan Stadium.

TIME	EVENT	LOCATION
11:00 AM – 1:00 PM	Presenter Check-In (Set-Up)	Huntington Club – 4th Floor Lobby
1:00 PM – 2:15 PM	Session A Presentations	Huntington Club – Main Floor
2:30 PM – 3:45 PM	Session B Presentations	Huntington Club – Main Floor
1:00 PM – 4:00 PM	Graduate School Fair	Huntington Club – Main Floor

Poster Presentation Schedule

Students will only be present at their poster during the following assigned times:

CATEGORY	SESSION A SECTIONS 1:00 – 2:15 PM	SESSION B SECTIONS 2:30 – 3:45 PM
Agriculture & Animal Science	1 & 2	
Biochemistry & Microbiology	1 , 2, 3, 4, 5, 6 & 7	
Biosystems & Agricultural Engineering	1 & 2	
Cell Biology, Genetics, & Genomics	1, 2, 3, 4, 5 & 6	
Chemical Engineering & Materials Sciences	1 & 2	
Computer Science & Engineering	1, 2, & 3	
Electrical & Computer Engineering	1, 2, & 3	
Environmental Sciences & Natural Resources	1	
Epidemiology & Public Health		1 & 2
Integrative Biology		1, 2 & 3
Mechanical, Civil, & Environmental Engineering		1, 2 & 3
Pharmacology & Toxicology		1, 2, 3, 4, & 5
Physical & Mathematical Sciences		1, 2, 3 & 4
Social Sciences		1, 2, 3, 4, 5, 6 & 7

GRADUATE SCHOOL FAIR

We are pleased to incorporate a graduate school fair into Mid-SURE. Students who are interested in pursuing graduate school are encouraged to connect with representatives from the following institutions/departments:

INSTITUTION	DEPARTMENT
Michigan School of Professional Psychology	Office of Admissions
Michigan State University	BioMolecular Science Gateway
Michigan State University	Career Services Network
Michigan State University	Cell & Molecular Biology Program
Michigan State University	College of Engineering
Michigan State University	College of Human Medicine Master of Public Health
Michigan State University	Epidemiology & Biostatistics
Michigan State University	Microbiology & Molecular Genetics
Michigan State University	MS in Marketing Research Program
Michigan State University	Neuroscience Program
Michigan State University	Pharmacology & Toxicology
Michigan State University	School of Human Resources & Labor Relations
Michigan State University	Special Education
Michigan State University	The Graduate School
Michigan Technological University	The Graduate School
Northwestern University	McCormick School of Engineering & Applied Sciences
Oakland University	Graduate Study and Lifelong Learning
Purdue University	The Graduate School
University of Kansas	Self Graduate Fellowship
University of Michigan	School of Public Health
Van Andel Institute	PhD Graduate Program

ABSTRACTS

Abstracts are organized by discipline and then by poster number within each category. An index of student presenters is located at the back of the program book.

AGRICULTURE & ANIMAL SCIENCE

INVESTIGATING THE GENETIC CONTROL OF LATERAL SHOOT ORIENTATION

Mallory St. Clair
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 1
Mentor(s): Courtney Hollender

The global population is predicted to rise to nearly ten billion by 2050. As the population increases, so will the demand for food. During the 1950's Green Revolution, the genetic controls of architecture of cereal crops such as wheat, maize, rye and corn were studied to increase the supplies and sustainability of these foods. This project is part of an effort to breed fruit trees with architectures that allow for high density plantings, which will help maintain a sustainable supply of healthy fruit. The work described here investigates the genetic control of lateral shoot orientation by the genes *TAC1*, *LAZY1*, and *WEEP* in model *Arabidopsis thaliana* plants. Mutant analyses have shown that these genes influence tree architecture, but little more is known. To begin to understand the molecular function of these genes in detail, a dynamic reporter gene system was used to assess their expression in real time. Transgenic *Arabidopsis* plants containing the architecture gene promotor driving a luciferase reporter gene were imaged in a dark environment with a sensitive camera. Light captured by the camera corresponds to expression of the architecture gene. This system was also used to visualize auxin localization in *tac1* and *lazy1* mutants and wild type plants using the *DR5* gene promoter to drive a luciferase reporter gene. In addition, phenotypes of Arabidopsis with mutations in uncharacterized genes that are differentially expressed between *tac1* and *lazy1* mutants were investigated to determine if these uncharacterized genes also impact branch orientation.

EFFECT OF BOVINE LEUKEMIA VIRUS (BLV) ON CONCENTRATIONS OF ANTIBODIES IN MILK AND SERUM

Monika Dziuba, Ashley Greenlick
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 2
Mentor(s): Paul Coussens

Bovine Leukemia Virus (BLV) is a disease of growing concern in the dairy industry. BLV is a delta-retrovirus, similar in structure to human immunodeficiency virus (HIV). BLV can cause lymphocytosis through unregulated proliferation of B-cells. The prevalence of BLV has grown over the years with 83% of US dairy herds containing infected cows. BLV is transmitted horizontally through bodily fluids, likely by veterinary practices. BLV causes decreased milk production and increased risk of infected cows being culled, possibly due to reduced immune function. This results in large economic losses for producers. Our goal was to determine if BLV infection altered antibody levels in infected cows. Using Enzyme Linked Immunosorbent Assay (ELISA), serum was analyzed for total and antigen-specific IgG, IgM, and IgA levels. Serum from BLV+ cows had significantly lower total and antigen-specific IgM levels than serum from BLV- cows. Using paired samples, total antibody levels in BLV+ and BLV- cows were tested in both serum (n= 34+,15-) and milk (n=71+, 54-). We noted a significant ($p<0.05$) decrease in total IgM concentration in milk from BLV+ cows, compared to BLV- cows. In contrast, there was a significant ($p<0.05$) increase in IgA concentration in serum from BLV+ cows, compared to BLV- cows. Altered antibody concentrations may affect immune functions in BLV+ cows in both serum and at mucosal sites. While no significant difference was detected in total IgG, there could be differences in antigen specific levels. Future testing will focus on antigen-specific antibody levels in BLV+ versus BLV- cows following vaccinations.

SCREENING FOR POTENTIAL BIOCONTROL AGENTS PRESENT IN ASYMPTOMATIC COLORADO BLUE SPRUCE (*PIECEAE PUNGENS*) AGAINST *DIAPORTHE* SPP. IN MICHIGAN
Gabdiel E. Yulfo-Soto
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 3
Mentor(s): Carmen Medina-Mora, Keumchul Shin, Monique Sakalidis

The Colorado Bruce Spruce (CBS; *Pieceae pungens*) is the fourth most popular species for Christmas tree production; with an average of 23.70 acres of CBS grown per grower in Michigan. In the past ten years, there had been a significant increase of symptomatic adult and landscape CBS, of which isolation from the cankers in the symptomatic tree branches and molecular characterization, suggests that *Diaporthe* spp., is the casual agent. This decline corresponds to an initial loss of needles and eventual branch dieback from the lower portion of the tree gradually progressing upwards. *Diaporthe* spp. have a broad host and geographical range and are a threat to economically important crops throughout the world. It is important to investigate the epidemiology of disease in order to implement a sustainable management plan. Throughout the Lower Peninsula of Michigan there are many asymptomatic CBS next to symptomatic CBS, which may suggest that the asymptomatic trees are hosting potential endophytic fungi that inhibit the growth of *Diaporthe* spp. We believe that these endophytes may be isolated, identified and trailed for their antagonistic effect against *Diaporthe* spp. We will attempt to survey the endophytic fungi hosted in both symptomatic and asymptomatic CBS using vascular tissue isolation into culture media. Then grouping them into morphological groups, and later molecularly identify them. To determine whether the isolates of the asymptomatic CBS have an antagonistic effect over the *Diaporthe* spp., they will be put under dual culture, and their interaction will be observed.

MANIPULATING CERTAIN PATHWAYS TO MAKE MAIZE MORE NUTRITIOUS
Evan Buckner
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 4
Mentor(s): Erich Grotewold, Nan Jiang

For over a century Maize has risen to be the United States' top commodity crop, and is one of the most accessible crops in the country and world. However, through continuous hybridization of maize for selected traits there has been a reduction of the flavone apigenin, a subclass of the flavonoid family. Apigenin has been linked to quelling the onset of certain chronic diseases such as liver, lung, and colon cancer, heart disease, and Type II Diabetes. In addition to helping stop chronic diseases the apigenin also possesses anti –inflammatory, anti-carcinogenic, and anti-angiogenic activities as well as restores the body to normal metabolic functioning. Within maize, there are a number of pathways that (when blocked) allow for certain flavonoid pathways, flavones and phlobaphenes, to be expressed. Specifically we looked at the flavone apigenin through blocking the pathways that lead to phlobaphenes, maysin. We believe that by blocking these pathways in the maize, that there will be an increased amount of the flavone apigein. To obtain the higher content of this flavone we used the line P1-rr;a1 which from prior studies, was found to have an increased amount of the apigenin. We crossed this with sm1 and sm2. The sm1 and sm2 strains are phenotypes that have salmon colored silks and produce the flavone maysin which aids the plant in the deterrence of the corn earworm pest. In growing these lines we see the homozygous recessive allele P1-rr:a1;sm1 and P1-rr:a1;sm2 that have the right combination of alleles to possibly show the increased apigenin. Through breeding these two (three possible sets) we hope get a recessive double mutant that contains a higher content of the apigenin chemical through blocking of the flavones in the final mature maize plant.

THE EVOLUTION OF PATHOGENICITY IN THE FUNGUS FUSARIUM GRAMINEARUM THROUGH EXPLORATION OF SPORE GERMINATION GENES
Claudia Petrucco
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 5
Mentor(s): Frances Trail

Fusarium graminearum is an agriculturally important fungus causing Fusarium head blight (FHB) in wheat and barley which decreases quantity and quality of crop yield. The FHB disease cycle begins when F. graminearum spores, called conidia, reach a host plant and germinate, initiating colonization of susceptible heads. The aim of this study is to determine the evolutionary history of spore germination in F. graminearum by analysis of orthologous genes in fungal plant pathogens. Six fungal species underwent transcriptomic analysis in vitro and in planta to identify orthologous genes showing far greater expression in one lineage compared to the other. Gene knockouts were conducted and carried out on the genes highly expressed in the F. graminearum lineage, and positive transformants were confirmed via PCR checks on gDNA and cDNA. Deletion mutants were then phenotyped in vitro and in planta and compared to the

wild-type strain for differences in their spore structure and functions. Deletion mutants from a variety of genes displayed a range of knockout phenotypes during plant infection, spore development and maturation, and conidia morphology, production, and growth. The genes studied provide potential targets for disease control in the vital stage of the disease cycle of FHB.

ANIMAL BEHAVIOR IN ASIAN HONEY BEES
Jaxon Goggins
Category & Time: Agriculture & Animal Science, Section 1, 1:00 - 2:15 PM
Poster: 6
Mentor(s): Fred Dyer

The honey bee, *Apis mellifera*, is one of the top pollinators and the only honey bee that is found throughout the world (except Antarctica). Though this species is under threat because of lack of floral biodiversity, pesticides, and loss of habit. Decline of *A. mellifera* and other pollinators may destabilize ecosystems. A similar problem may exist in the Asian tropics, where there are a half dozen or more species of honey bees, but little is known about the factors affecting the health and well-being of honey bees in this region. This study examines three species-- *A. cerana*, *A. dorsata*, and *A. florea*--to understand their search behavior and reactions to changes in food quality. Specifically, we examine the willingness of foragers to search for better food when a known resource declines in quality; search behavior is costly, so the decision to search may affect the bees' survival and colony health. The experiment was set up with two feeders containing concentrated sucrose water, one feeder being as low as it could be without the bees abandoning it ("Constant Feeder"), and another with a 2M sucrose ("Test Feeder"). Then a test bee was trained to feed from the Test Feeder and then the high-quality food was replaced with water to see how the bee would search for the missing 2M food before reaccepting the lower quality Constant Feeder. The bees were recorded on video. We observed the video and scored (1) the times at which the test bee visited the test feeder or the constant feeder, (2) the duration it was in contact with the feeder or the platform the feeder was sitting on, (3) how long the bee fed. For each species we had decided upon a contact duration that met the threshold to be considered feeding. In *A. cerana* we found bees reaccepted the Constant Feeder almost as soon as they detected water in the Test Feeder, but would continue to check the Test Feeder in case the food source returned. Compared with *A. cerana*, both *A. dorsata* and *A. florea*, would continue to persist at the Test Feeder after it was replaced with water, and when they went back to check the Constant Feeder they were slower than *A. cerana* to accept it. With this we conclude that *A. cerana* has evolved to be more willing to accept whatever food is available, while *A. dorsata* and *A. florea* persist in searching for better food (assuming they have recent experience that better food is available).

ACCESS TO HEALTHY FOOD IN YPSILANTI, MI
Daniel Babayode
Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 9
Mentor(s): Kathryn Colasanti, Michelle Byrd, Janee Moore, Judith Barry

Access to healthy food is a significant problem throughout the world. This project analyzes this issue, with the purpose of better understanding access to fruits and vegetables in Ypsilanti, Michigan. A survey was conducted in 2016, asking members of the community about their perceived level of food access. This assessment was targeted at low-income individuals, as their access to healthy food is often more limited than others. The study was comprised of questions referring to: the availability of fresh fruits and vegetables in the neighborhood, the quality of fruits and vegetables, the availability of Michigan grown fruits and vegetables, and the availability of food stores meeting shoppers' needs. It also involved the examination of factors critical to shoppers when choosing where to purchase food, such as: quality, price, fruit and vegetable consumption, distance from home, and mode of transportation. Initial results found that most respondents were food insecure, meaning that they sometimes or often ran out of food. The research question being investigated is: does the average time people travel to food retail sites vary by census tract? The survey will be coded and transported into SPSS, a software package used for statistical analysis. Descriptive statistics will be used to compare survey respondents from different census tracts. This research may be used to influence the Washtenaw County Food Policy Council to make decisions that will positively impact the food needs of the community. The methodology and findings of this project can also be used as a tool for future studies of this nature in other communities.

MODULATION OF HEPATIC DIVALENT MINERALS WITH INCREASING IRON CONCENTRATIONS IN PERISSODACTYLA

Nathan Buchweitz

Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 10
Mentor(s): Dalen Agnew

Perissodactyla are an order of odd-toed ungulates that includes the families Equidae, Tapiridae, and Rhinocerotidae. It is well established that specific species of rhinoceros (Black and Sumatran) are susceptible to the development of hemochromatosis, or iron-storage disease. Additionally, case reports have confirmed that horses and tapirs may also exhibit excessive iron accumulation within their hepatocytes. The purpose of the current study was to retrospectively evaluate interactions between iron and other divalent minerals (copper, zinc, molybdenum, and cadmium) influencing its accumulation in rhinoceros populations and to identify similar patterns with other affected species. To accomplish this, the Michigan State University Veterinary Diagnostic Laboratory database was queried for measurements of hepatic minerals in rhinoceros and equines during the time-period spanning January 1, 2007 to June 1, 2018. Iron distribution frequencies, and its associations with other divalent minerals were evaluated. For both rhinoceros and equine, iron concentrations exhibited a clear rightward skew with evidence for multimodal populations. This included an apparent normal subset with distinct modes of marked iron accumulation. In rhinoceros, there was a clear association between the species examined and iron accumulation. Increasing concentrations of iron led to notable decreases in hepatic copper and zinc, while molybdenum and cadmium featured a modest increase. Future studies will include a factor analysis to unveil latent variables that may link our understanding of divalent mineral flux in hepatocytes with increasing iron load and species vulnerability.

EFFECTS OF CBP60G OVEREXPRESSION ON FLG22-INDUCED GENE EXPRESSION AND SA HORMONE LEVELS

Diana Medina-Yerena

Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 11
Mentor(s): Christian Danve Castroverde, Adam Seroka, Sheng-Yang He

Studies show that ambient temperature is a significant factor in the development of plant diseases. This idea is incorporated in the “plant disease triangle” concept that a conducive environment is equally important as the plant and pathogen involved. Recently, it was reported that increased temperatures enhance the susceptibility of the model plant *Arabidopsis thaliana* to the bacterial pathogen *Pseudomonas syringae pv. tomato* (Pst) DC3000 by suppressing host salicylic acid (SA) biosynthesis mediated by Isochorismate Synthase 1 (ICS1). Our lab recently demonstrated that elevated temperature negatively regulates the ICS1-binding transcription factor Calmodulin-Binding Protein 60G (CBP60g) gene, with its overexpression at elevated temperatures restoring SA accumulation during Pst DC3000 infection. Surprisingly, CBP60g gene expression remained unchanged at ambient and elevated temperatures when leaves were treated with pathogen-derived flg22 peptide; however, SA biosynthesis was still negatively influenced. In this study, we aim to determine whether CBP60g overexpression will restore ICS1 gene expression and SA biosynthesis after flg22 treatment at elevated temperatures. To complete our experiments, *Arabidopsis columbia*-0 wild-type and 35S-CBP60g overexpression lines will be temperature-acclimated at ambient 23 °C (control) or 28 °C (test), and then infiltrated with flg22 and mock treatments. We will then use quantitative reverse transcription PCR (qRT-PCR) to quantify CBP60g, ICS1, and PR1 gene expression levels. Phytohormones will be extracted and the levels of SA and SA 2-O-β-D-glucoside (SAG) will be quantified using high-performance liquid chromatography-mass spectrometry (HPLC-MS). Overall, these results will help unravel molecular mechanisms in plant disease that play a part in the current global threat to food security.

THE FATE OF SOIL ORGANIC MATTER UNDER ADDITIONS OF BIOENERGY CROP RESIDUES AND ROOT EXUDATES
Jenifer Gonzalez
Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 12
Mentor(s): Lisa Tiemann, Matthew Reid

Dedicated energy crops that are grown and harvested for biofuel and bioproduct production are an important and promising alternative to petroleum-based products. Bioenergy crops have the potential to increase soil carbon (C) sequestration, making them a potentially C-negative energy source. In order to understand the impact of bioenergy crop residues (e.g. root and shoot material) on soil C dynamics, we conducted an incubation study to explore the decomposition of residues (roots, shoots, and root plus shoots) from two bioenergy crops: corn (*Zea mays*) and switchgrass (*Panicum virgatum*). Soils and residues were incubated at 23°C and 50% water holding capacity. Over the course of 39 days, respiration rates were measured by collecting gas samples at two time points (immediately after sealing jars and 2-3 hours later) before determining CO_2 concentrations on a gas chromatograph. Respiration rates were calculated as the difference between CO_2 concentrations at the two times points. Preliminary results show a 393% increase in respiration when residue was added over soil alone. When comparing different residue treatments across both species, respiration rates with shoots and roots were 24% greater than with roots alone and shoot residue produced greater respiration rates than either roots or roots and shoots (59% and 28% increase respectively). When comparing respiration rates between species we found 17% lower rates with switchgrass relative to corn residues. Root material and any material from perennial switchgrass have the potential to reduce C losses whereas corn and aboveground shoot material may increase respiration rates.

THE EFFECT OF SHEARING MID-PREGNANCY CROSSBRED SHEEP ON PLACENTAL SECRETORY FUNCTION
Alexander Mantey
Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 13
Mentor(s): Almudena Veiga-Lopez

Manipulating the maternal environment during gestation can influence fetal development. Mid-pregnancy shearing increases lamb birth weight through an unknown mechanism. Pregnancy associated glycoproteins (PAGs) are placental products that are indicators of feto-placental well-being. We aimed to determine if mid-pregnancy shearing results in improved placental secretory function accounting for increased offspring birth weight. Single-bearing pregnant Dorset-Polypay ewes were allocated into two groups: shorn at gestational day (GD) 100 (S; n=18) and a control group (C; n=20; sham shorn at GD100). Maternal serum samples were collected weekly two weeks prior to shearing until parturition for PAG assays (IDEXX, ELISA assay). Lamb sex (M: males; F: females), birth weight, and body mass index (BMI) were recorded at birth. S male lambs (SM) were born heavier (SM: 5.94±0.20 vs. CM: 5.27±0.30 kg; $P<0.05$) and their BMI larger (SM: 0.49±0.03 vs. CM: 0.42±0.03; $P<0.05$) than control males (CM). S female lambs (SF) were also born heavier (SF: 5.09±0.18 vs. CF: 4.67±0.14 kg; $P<0.05$) and their BMI larger (SF: 0.41±0.02 vs. CF: 0.37±0.01; $P<0.05$) than control females (CF). The interaction between shearing and sex for birth weight and BMI was not significant. PAG analyses are currently underway. Supportive of studies in other latitudes and breeds, shearing at GD100 increases weight and size at birth in singletons. PAG results will help us understand if mid-pregnancy shearing results in less resources spent on wool growth in favor of placental secretory function contributing to fetal growth, thus resulting in increased birth weight.

REPELLENCY OF PLANT ESSENTIAL OILS AGAINST DROSOPHILA SUZUKII
Phil Duran
Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 14
Mentor(s): Ke Dong, Qiang Wang

Spotted winged drosophila is a serious pest that consumes various crops for its own species nourishment. These insects are able to smell various chemicals in the environment. Some of these chemicals are attractive to SWD, and others are repellents. It is critical to identify strong repellents in order to dissuade these pests from inflicting damage on agro systems. Plant essential oils have been shown to exhibit high repellency against arthropod species. It is hoped that the current study will help give farmers better pest management options, and obtain better yield production. To identify repellency against SWD, plant essential oils on two types of fly behavioral assays: T-maze and two-choice assays. The chemicals utilized in this study include E-B-Farnesene, Linalool, and Geranyl acetate. A series of concentrations of the tested compounds will be used in the behavioral assays to generate dose-response curves. The control chemical is

DMSO. These experiments will allow us to determine whether these compounds elicit repellency and the potency of repellency. Our findings will further increase the knowledge of Drosophila suzukii preference.

ENHANCING THE DETECTION OF EQUINE HERPESVIRUS-1 (EHV-1) BY QUANTITATIVE POLYMERASE CHAIN REACTION (PCR): OPTIMIZING THE DEOXYRIBOSE NUCLEIC ACID (DNA) EXTRACTION METHODOLOGY

David Sokol
Category & Time: Agriculture & Animal Science, Section 2, 1:00 - 2:15 PM
Poster: 15
Mentor(s): Roger Maes

Equine Herpesvirus-1 is a double-stranded DNA virus that is enzootic in horse populations and is able to cause abortions, respiratory diseases and encephalomyelitis. Developing sensitive diagnostic assays is a priority of veterinary diagnostic laboratories, as they provide veterinarians with accurate laboratory results at low concentrations of an infectious agent. This project seeks to increase the sensitivity of a quantitative PCR assay used to diagnose an EHV-1 infection by comparing the efficiency of EHV-1 DNA isolation by three commercial nucleic acid extraction kits. Each nucleic acid extraction kit was used to isolate DNA from a dilution series of an EHV-1 viral isolate and from nasal swabs of horses experimentally infected with EHV-1. The DNA isolated from these samples served as the template for a quantitative PCR assay used to diagnose an EHV-1 infection. This presentation will summarize the methods and results of the experiment, which demonstrated differences in the efficiency of EHV-1 DNA isolation between the nucleic acid extraction kits. The results of the experiment indicate the sensitivity of a quantitative PCR assay used to diagnose an EHV-1 infection can be increased by optimizing the DNA extraction methodology.

BIOCHEMISTRY & MOLECULAR BIOLOGY

INVESTIGATIONS INTO THE INTERACTIONS BETWEEN FUNGI, GREEN ALGAE AND BACTERIA

Kayla Burnett
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 18
Mentor(s): Ben Lucker, Gregory Bonito

Fungus[KB1], bacteria and algae variably affect plant health. Interaction with bacteria can lead to mutualistic associations for constant exchange of resources. In this study, we will test the interaction of fungus, bacteria and fresh water algae with [KB2][KB3] the absorption of lanthanides. Lanthanides are used by microorganisms to obtain carbon that support metabolic processes to elongating lipids and sugars. Once the species have established and grown, absorption tests will be conducted in different concentrations of media[KB4]. Fungal family Mucoromycota, a diverse family of fungus that include many genera such as Umbelopsis and Mortierella, have made mutualistic associations with both bacteria and algal species we are interested in. Both the fungus and the bacterium need sustainable nutrient sources to associated and use the lanthanides present in the media. At 1:10 dilution of malt extract broth metabolic growth is an arrested state. In the future we will analyses the usage of lanthanides in the associative relationships between freshwater alga, fungus and bacteria.

FINDING WHY OSCILLATIONS OCCUR AND WHAT BRINGS THEM BACK TO STEADY STATE

Madeline Bresson
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 19
Mentor(s): Thomas Sharkey

Photosynthesis is comprised of both the Calvin-Benson cycle and light-dependent electron transport, which must work at the same speed to avoid the damage of redox stress. At a high photosynthetic rate, inorganic phosphate concentration decreases and photosynthesis is limited to the rate at which phosphate is released by end-product synthesis. This triose phosphate utilization (TPU) limitation leads to a constriction of ATP synthase, which ultimately limits electron transport. Many systems are known that control steady state photosynthesis, but less is known about how the plant returns to steady-state. Oscillations can be induced in Nicotiana benthamiana leaves under TPU conditions to study how phosphate metabolism responds to swift changes in photosynthetic rate. I have taken rapidly frozen leaf samples at the crests and troughs of the oscillations and at steady state to preserve high-turnover organic phosphates. Mass spectroscopy was used to quantify organic phosphates. The differences between the crests and

troughs of the oscillation were compared to steady state values to determine how TPU leads to oscillations in the photosynthetic rate.

AN EXAMINATION OF ENTERIC PHAGES EFFECTS ON THEIR HOST CELL'S POPULATION GROWTH
Ashleigh Bass
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 20
Mentor(s): Kristin Parent

Bacteriophages -viruses that infect bacteria- are the most abundant and most diversified microorganisms on Earth. Like all viruses, phages only reproduce after infecting suitable host bacteria and the survival of phages solely depends on their ability to infect their bacterial hosts. Successful dynamic adaptation of bacteriophages when facing selective pressures, such as host adaptation and resistance, dictates their abundance and diversification. Co-evolution of phages and host determine their bacterial host range, phage entry, and other infection parameters. Phages are widely distributed in locations populated by bacterial hosts, such as soil or the intestines of animals. The most common phages infect laboratory strains of *Salmonella enterica*, *Escherichia coli*, and *Shigella flexneri*, all three of which can cause bacterial infections by contaminated by food or water. The goal of this project is to determine the amount of phages needed to kill a bacterial population using a multiplicity of infection killing curve, the rate of cell lysis using a spectrophotometer population growth assay and calculate the average number of new virions released from a single infected bacterial cell using a burst curve. This is particularly important because it is the first step in creating a computer algorithm that will be able to be accessed by the scientific community. The computer algorithm will use the experimentally derived parameters from the experiments conducted in the lab to predict the behavior of new phages. This will allow things like *Salmonella*, *Shigella* and *E. coli* outbreaks with different produce to become a thing of the past.

STRUCTURAL ANALYSIS OF ELECTROMAGNETIC PERCEPTIVE GENE (EPG) PROTEIN THROUGH USE OF X-RAY CRYSTALLOGRAPHY
Everett Baxter
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 21
Mentor(s): Assaf Gilad, Sunayana Mitra

Electromagnetic perceptive gene (EPG) is a newly discovered gene (Krishnan et al., (2018) originally found in Kryptopterus Bicirrhis (Glass fish). This gene expresses a unique protein that is responsible for the fish's ability to sense and respond to electromagnetic field (EMF). When this gene is cloned into mammalian cells, changes in intracellular calcium concentrations is observed in response to external EMF stimulation. Intracellular calcium levels are important for proper functionality of neurons and other body systems with calcium dependent signaling. Thus, this property of the EPG protein can be useful in developing neuromodulatory therapeutics that can be non-invasively controlled by EMF stimulation. However, the mechanism by which this protein converts magnetic signals into biochemical signals remains unknown. We then hypothesize that by resolving EPG structure we can identify the EMF perceptive region of the protein. To characterize the protein structure of EPG protein, we will be using Polymerase chain reactions (PCR), cloning, Agarose gel electrophoresis, SDS-PAGE, and Size exclusion chromatography followed by fast protein liquid chromatography. This purified protein will be subsequently crystallized, exposed to X-rays to generate structural data, analyzed using appropriate software. We anticipate that EPG structural data and predicted secondary structure using JPred software are similar. Identifying the EPG perceptive region will aid in designing a better form of EPG that is more stable and more robustly affected by EMF stimulation. A better EPG protein can help design better ways to remotely and non-invasively control cellular activity in the central nervous, the cardiac, and muscular system.

QUANTIFYING THE BINDING FORCE BETWEEN ALBUMIN AND PREDNISOLONE
Sergio Escobar
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 22
Mentor(s): Dana Spence

Multiple sclerosis (M.S.) is the most widespread disabling neurological condition of young adults around the world. Current treatments are ineffective and are often accompanied by serious side effects. Steroids have shown potential as a therapeutic alternative through a proposed mechanism of disrupting the cascade system that leads to the depletion of myelin and deterioration of the blood-brain barrier associated with M.S. Equilibrium dialysis will be employed to evaluate the binding force between albumin and the steroid prednisolone. The binding force will be measured by the quantity of prednisolone that remains unbound and flows through the membrane. An ELISA kit designed specifically for this

purpose will be employed to measure the concentration of prednisolone. The proposed conclusion is that the binding force will be significant and the steroid prednisolone will be found to act directly on albumin. To confirm so a test to evaluate if any binding occurs between prednisolone and the red blood cells will also be performed. Future research will evaluate if the steroid specifically blocks binding of C-peptide, zinc, or the full albumin C-peptide compound, to GLUT1 receptors.

FLEXIBLE SOLAR POWERED MICROBIAL CONSORTIA: AN ALTERNATIVE PLATFORM FOR SUCROSE AND BIOMETABOLITE PRODUCTION
Maximilian Cox, Ryan Williams
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 23
Mentor(s): Daniel Ducat

The growing need for bioindustrial products (ie. biofuels, plastics) requires a greater amount of carbohydrate inputs to meet consumer demands. Mass collection of carbohydrates from agricultural feedstocks in turn results in less viable land for food production, creating conflict of interest between food and chemical commodity markets. Alternatiely, photosynthetic microbes (*i.e.*, cyanobacteria or algae) may grow on non-arable lands and without potable water, potentially allowing for bulk sugar production without competing for agricultural resources. Our laboratory has engineered a strain of *S. elongatus PCC 7942* that produces large quantities of sucrose by expressing two heterologous genes: sucrose-proton symporter (*cscB*) and sucrose phosphate synthase (*sps*). The engineered *S. elongatus* produces sucrose up to 80% of total biomass under laboratory light intensities, which could theoretically outperform the best plant-based carbohydrate feedstocks (e.g. sugarcane) by several fold. We explore the use of these cyanobacteria to create flexible co-cultures whereby the sugars secreted support the growth and bioproduction of useful metabolites, including the bioplastic polyhydroxybutyrate (*PHB)* from *Halomonus bolievensis* co-cultures. Preliminary studies demonstrate promising results for large-scale application, however experiments have so far been restricted to laboratory growth conditions. Herein, we assess the feasibility of large scale productivity using bioreactors that simulate more realistic light conditions for scaled production, including day-light cycles and variable light intensity. We report the performance of this system under a range of light conditions that are more representative of outdoor environments, which will help to determine the viability of this approach for largescale applications and biochemical production.

FINDING NEW COMPOUNDS FOR SOLUBLE EPOXIDE HYDROLASE (SEH) INHIBITION USING VIRTUAL SCREENING
Elizabeth Tuason
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 26
Mentor(s): Alexander Dickson, Arzu Uyar

Human soluble epoxide hydrolase (sEH) is an enzyme that, when inhibited by the ligand TPPU, has been shown to be an effective treatment against neuropathic pain caused by diabetes in rodents. To find potent sEH inhibitors, different sEH-TPPU conformations (poses) were selected from a previously published study on sEH-TPPU unbinding simulations. For each pose, pharmacophore-based screens were performed with Pharmit using a set of spatially-organized features taken from TPPU (e.g. hydrogen bond donors/acceptors, aromatic rings, hydrophobic groups). Ligands that have the same features in the same orientation as the given sEH-TPPU pose were returned as a dataset and were docked onto each of the sEH poses using Schrödinger Glide docking software. Ligands with lowest docking scores for the bound state and not the transition state can be used to initialize new unbinding simulations. Furthermore, since ligands with longer residence times (i.e. the amount of time the ligand is bound to its target) have been shown to be more potent treatments, these results can be used to predict which ligands would have the longest residence time or even have alternative bound poses. These ligands could serve as potential drugs for treating pain.

DETERMINATION OF THE SUBSTRATE RANGE OF ESCHERICHIA COLI CSID
Ricardo Aquino
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 27

The substrate range of *Escherichia coli* CsiD was determined through the conduction of various enzymatic assays. The optimal substrate standard for the assay was 100mM 2-oxoglutarate (2OG) and its activity was monitored daily by an preliminary OPD assay where 250uL aliquots were taken from reaction tubes of differing 2OG concentrations (0mM, 0.1mM, 0.25mM, 0.5mM, 0.75mM, 1mM, 1.5 mM, 2mM) and each transferred to corresponding tubes with 1 mL of OPD. The interaction of OPD with 2OG was observed by absorption spectroscopy and from this data a linear curve was

derived from which the concentration of 2OG would be calculated for the full scale assay. For the full scale assay, 8 reaction tubes were used, each contained differing volumes of Hepes buffer 100mM pH 7 and 100mM glutarate while keeping the amount of 2OG and CsiD enzyme constant, 20uL and 7uL respectively. Additionally, 2uL of 100mM ferric (II) solution were added to each tube, all together the volume of each tube equaled 2mL. When conducting the assay, 7uL of the CsiD was added to a reaction tube, immediately, the tube was vortexed quickly and 250uL of the reaction mixture were transferred to tube containing 1 mL of OPD, the reaction tube was then placed in a water bath kept at 37° C. This was done five times per reaction to obtain the consumption of 2OG at 0, 3, 5, 7, and 10 minute intervals. The same assay was performed with different substrates.

EVOLUTION OF TROPANE ALKALOID BIOSYNTHESIS
Maria Contreras Ramos
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 28
Mentor(s): Cornelius Barry

Collectively, plants synthesize hundreds of thousands of specialized metabolites of diverse chemical classes that facilitate adaptation to diverse environments. While the biosynthesis and function of the majority of these specialized metabolites remains unknown, those that are characterized, often function in plant defense against pathogens or herbivores or in communication with beneficial organisms such as pollinators or seed dispersers. The bioactivity of many plant specialized metabolites has led to their cooption by humans for use as flavorings, fragrances, natural pesticides, and medicines. Tropane alkaloids are a diverse class of medicinally important plant specialized metabolites that includes the pharmaceuticals hyoscyamine and scopolamine and the narcotic cocaine. Approximately 200 tropane alkaloids have been identified and they are synthesized by just a few plant families through a pathway that is only partially characterized. The Solanaceae (potato family) and Brassicaceae (cabbage family) are two agriculturally important plant families that synthesize tropane alkaloids and last shared a common ancestor approximately 115 million years ago. Not all members of the Solanaceae and Brassicaceae synthesize tropane alkaloids and not all species within each of these families synthesize the same tropane alkaloids. We are interested in understanding the biochemical evolution of tropane alkaloid biosynthesis through addressing the following questions: 1) Is tropane alkaloid biosynthesis conserved in diverse plant families? 2) What are the biochemical signatures that give rise to tropane alkaloid variation within a plant family? Experiments addressing these questions using examples of tropane alkaloid variation in the Solanaceae and Brassicaceae will be presented.

USING TOBACCO TRANSIENT EXPRESSION SYSTEM TO STUDY A NEW PLAYER IN TOMATO ACYLSUGAR BIOSYNTHETIC PATHWAY
Rachel Combs
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 29
Mentor(s): Pengxiang Fan

Plants are master chemists and produce a wide assortment of specialized metabolites. It is important to understand the biosynthetic pathways of these metabolites because they have many applications, such as insect resistance in crops and medicinal compounds for pharmaceuticals. Acylsugars, a natural pesticide, are specialized metabolites produced in the trichomes of nightshade family (*Solanaceae*) plants. Four Acylsucrose Acyltransferases (ASAT) have been identified that catalyze consecutive reactions using sucrose and acyl-CoA molecules as substrates to synthesize the cultivated tomato acylsucroses *in vitro*. However, how the acyl-CoAs are synthesized in the trichomes is still unclear. Recent genetic screening revealed reduced accumulation of long chain containing acylsugars when a tomato enoyl-CoA hydratase gene (*ECH80*) is knocked out. Therefore, we hypothesize that *ECH80* is involved in making the long chain acyl-CoAs in tomatoes. Our first objective is to reconstruct the long chain containing acylsugars in the tobacco leaves, through transiently co-expressing the tomato *ECH80* and the ASAT genes followed by LC/MS analysis of the long chain acylsugars. Our second objective is to study the evolution of *ECH80* enzyme activity in the *Solanaceae* family. *ECH80* homologs from representative *Solanaceae* species will be cloned and transiently expressed in tobacco leaves. Their different abilities to generate long chain acyl-CoA derived products are used to infer the evolutionary history of *ECH80*. This study will not only contribute to the knowledge of the acylsugar biosynthesis network, but also set the stage for future work using synthetic biology approaches to engineer acylsugars and other metabolites in plants.

THE ROLE OF TSPO AND THE ARYL HYDROCARBON RECEPTOR IN THE RESPONSE OF NEUROINFLAMMATION IN MICROGLIAL CELLS
Brielle Leon
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 30
Mentor(s): John LaPres, Elahe Crockett-Torabi, Michelle Steidmann

Introduction: Neuroinflammation plays a critical role in the progression of Alzheimer's and Parkinson's Disease. Most of the immune response associated with these diseases is carried out by microglial cells. Diagnostic imaging for neuroinflammation relies on infiltration of activated microglia. The primary target for neuroimaging reagents is the translocator protein (TSPO). TSPO is a mitochondrial specific protein. The endogenous role for TSPO remains unclear, however, it has been linked to cholesterol and heme metabolism, as well as, steroidogenesis and oxidative stress. Cholesterol and heme metabolites also influence the activity of the aryl hydrocarbon receptor (AHR). The AHR is a ligand activated transcription that mediates the biological responses to various exogenous chemicals, including 2,3,7,8-tetrachloro-p-dioxin (TCDD). Recently, a portion of the cellular pool of AHR was found in mitochondria. Hypothesis: TSPO and AHR influence microglial activation by modulating mitochondrial activity. Methods/Results: We have created TSPO-deficient cells, using CRISPR-Cas9 and the murine microglial cell line, BV2. Wild-type and TSPO-deficient cells were analyzed using qRTPCR, mitochondrial function, cell viability assays, and cellular ATP measurements in the absence and presence of AHR and TSPO ligands. Conclusion: The results suggest that TSPO plays a role in modulating mitochondrial energetics and microglial activation. Moreover, ligands for the AHR and TSPO can modulate these responses, suggesting some degree of crosstalk in microglial function. These results offer the first data supporting crosstalk between these two signaling pathways and suggest this interaction can impact neuroinflammation. Support: Brielle Leon is a REPID scholar, supported by NIH-5-R25-HL108864 to E.C.

SCREENING FOR OPTIMAL ACTIVITY OF KEY ENZYME IN THE PLASTIDIAL ISOPRENOID BIOSYNTHESIS PATHWAY
Kashawn Robertson
Category & Time: Biochemistry & Molecular Biology, Section 2, 1:00 - 2:15 PM
Poster: 31
Mentor(s): Aparajita Banerjee, Bjoern Hamberger

Terpenoids are the largest group of specialized metabolites in plants and play many key roles in various biological processes. In addition, various terpenoids have important commercial applications as biofuels, pigments, flavors and fragrance molecules, and pharmaceuticals. The building blocks for all terpenoids are the two 5-carbon units, isopentenyl diphosphate (IPP) and dimethylallyl diphosphate (DMAPP). In chloroplast, IPP and DMAPP are made by the methylerythritol 4-phosphate pathway (MEP) pathway. The first enzyme of this pathway, deoxy-D-xylulose-5-phosphate synthase (DXS), plays a significant role in the regulation of this pathway. It has been shown earlier that DXS is feedback inhibited by IPP and DMAPP. Thus it controls the carbon flux of the MEP pathway. Our aim is to increase the carbon flux into the MEP pathway by installing an improved DXS into this pathway. This work demonstrates the screening of different DXS from diverse organisms to identify a better candidate DXS. Various DXS candidates would be tested in the transient expression system *Nicotiana benthamiana*, where the activity of DXS would be measured by the production of casbene, a plastidial diterpene. In order to do that, DXS genes would be coexpressed with geranyl geranyl diphosphate synthase (GGPPS) and casbene synthase, the other genes required for the biosynthesis of casebene. Quantification of casbene would be done using gas chromotography-flame ionization detector (GC-FID). The best DXS candidate obtained from this work will be used in the future for bioengineering purposes to increase the production of terpenoids.

THE SEARCH FOR METABOLITE STRUCTURE FORMED IN ATROPA BELLADONNA PLANTS THAT MAKE SCOPOLAMINE AND HYOSCYAMINE
Hairol Breton
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 34
Mentor(s): Arthur Jones, Thilani Anthony

Plants synthesize a wide variety of compounds called specialized metabolites which aid plant survival in ways varying from defenses against insects to recruitment of animals that aid seed, pharmaceuticals development, and pollen dispersal. The *Solanaceae* family, which includes *Atropa belladonna* (Deadly Nightshade), produces a class of specialized metabolites known as tropane alkaloids. Tropane alkaloids are identifiable via their 8-azabicyclo[3.2.1]octane ring system. The tropane alkaloids scopolamine (303 g/mol) and hyoscyamine (289 g/mol) are examples of medicinal

compounds formed by the tropane alkaloid pathway. The identities of specialized metabolites can be revealed through analysis of plant tissue extracts using liquid chromatography-mass spectrometry (LC-MS). In *Atropa belladonna*, two metabolites of unknown structure (291 g/mol) are formed in parallel to scopolamine and hyoscyamine production. Thus, my objective is to determine the structures of the 291 g/mol metabolites. For this project, an *Atropa belladonna* root extract which was previously purified through an anion exchange column was provided. Several *A. belladonna* metabolites were purified using semi-preparative High Performance Liquid Chromatography (HPLC). Furthermore, characterization by mass spectrometry (MS), isolation via fraction collection and solvent evaporation are being utilized to obtain 2-3 mg of several *A. belladonna* metabolites for structure elucidation using nuclear magnetic resonance (NMR) spectroscopy. Structure elucidation of *A. belladonna* alkaloids will assist in better understanding the tropane alkaloid biosynthetic pathway and enable bioassays to be performed with purified compounds.

TRUNCATION MUTATIONS TO PROBE ACTIVE DOMAINS OF COMPROMISED HYDROLYSIS OF TRIACYLGLYCEROL 7 (CHT7) PROTEIN IN CHLAMYDOMONAS REINHARDTII

Chase Lindeboom
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 35
Mentor(s): Christoph Benning

Under nutrient-limiting conditions, microbes enter a quiescent state where they temporarily cease growth and accumulate high-value carbon compounds such as triacylglycerols (TAG) that can be used in biofuel and feedstock production. Upon nutrient resupply, TAG is degraded to fuel cellular growth; however, previous work has identified a mutant of the unicellular algae, Chlamydomonas reinhardtii, that was delayed in regrowth and degradation of TAG upon nitrogen resupply (NR). The mutant contained a deletion of a gene encoding for a protein termed Compromised Hydrolysis of Triacylglycerols 7 (CHT7). While CHT7 resembles known DNA binding proteins, the mechanism of how it regulates cell life-cycle decision making as well as its functional domain(s) are still largely unknown. To determine what portions of CHT7 are functionally important, we created truncation mutants of CHT7. The truncation mutations were created by the insertion of two stop codons at five different locations within the genomic sequence of CHT7 using site-directed mutagenesis PCR. Once complete, the stop-codon constructs will be introduced into the Chlamydomonas cht7 mutant, and the lines producing the truncated proteins will be identified by immunoblotting. We will then check these lines for complementation of cht7 mutant phenotypes such as delayed degradation of TAG and regrowth during NR following N deprivation. By examining which deletions lead to the loss of complementation, we can determine which portions of CHT7 are important for its activity, granting us a better understanding of cell life-cycle decision making that potentially could be utilized in engineering algae for biomass production.

ANALYZING THE RATE OF PRODUCTION OF REACTIVE OXYGEN SPECIES IN MITOCHONDRIA DURING ISCHEMIA REPERFUSION

Riya Malhotra
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 36
Mentor(s): Jason Bazil

Myocardial ischemia is a leading cause of hospitalizations and deaths in Western countries from a process known as ischemia-reperfusion (IR) injury. IR injury is characterized by an ischemic phase followed by a reperfusion phase. During the ischemic phase, the reduction in blood flow and oxygen levels primes the afflicted tissue for IR injury. During the reperfusion phase, the restoration of blood flow and oxygen levels results in a massive increase in the mitochondrial production of reactive oxygen species (ROS) and can trigger apoptosis. It has been hypothesized that significant levels of ROS production occur when the Q pool is partially oxidized. To test this hypothesis, fluorescence spectroscopy was utilized to measure ROS emission rates by antimycin-inhibited bc1 complex in guinea pig cardiac mitochondria. We used the CoQ10 analogues decylubiquinone and decylubinquinol to set the redox poise of the Q pool and measured ROS production from the bc1 complex. In this assay, hydrogen peroxide (H2O2) reduction was coupled to Amplex UltraRed oxidation to the fluorescent molecule, resorufin. The fluorescence signal was measured and quantified using an Olis DM245 spectrofluorometer. Our results thus far show that a partially oxidized Q pool is necessary for significant levels of ROS generation by the antimycin-inhibited bc1 complex.

ISOLATION OF ANTIBIOTIC RESISTANT ESCHERICHIA COLI FROM WATER AND GEESE FECES IN HIGH-TRAFFIC AREAS
Claudia Petrucco, Kayla Matheny
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 37
Mentor(s): Poorna Viswanathan

Escherichia coli is a gram negative enterobacterium that resides in healthy human and animal gut microbiomes as well as in fecal-contaminated environments. One contributing factor to the fecal contamination seen in areas surrounding lakes and streams is the Canadian goose, an organism whose microbiome has been shown to contain a variety of antibiotic resistant *E. coli* strains. Although the majority of *E. coli* serotypes are harmless, pathogenic strains exist that are capable of causing disease. Therefore, antibiotic resistant *E. coli* contamination of high-traffic areas by Canadian goose feces would raise serious public health concerns. In this study, *E. coli* strains were isolated from dried geese feces and water from the bank of the Red Cedar River. After verifying the isolated colonies were *E. coli* through 16s rRNA colony PCR, PCR tests were done to see if CRISPR genes were present in the genomes of each strain. 33 of these strains were tested for resistance to twelve commonly used antibiotics via a Kirby Bauer test, and 91% were found to be resistant to β-lactam and protein translation involved antibiotics. In order to determine the significance of this finding, plasmids from each strain were extracted and sequenced to see if the antibiotic resistance genes originated from them. It is hypothesized that *E. coli* strains isolated from geese feces in high-traffic areas along the Red Cedar River are hazardous to human and animal health due to their antibiotic resistance and potential ability to transfer this resistance to other bacteria.

IDENTIFYING CELLS ACCURATELY IN TWO-PHOTON IMAGING
Avery Denby
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 38
Mentor(s): Mark Reimers

Modern optical methods such as high-definition two-photon imaging of calcium fluorescence allow us to view the activity of tens of thousands of neurons in the brain. However, the key is to identify neurons in the images and track their activity. Due to the large number of neurons and images to sort through, manual methods of location, identification, and analysis of these individual neurons is tedious and time-consuming. Researchers need an automated system to complete in hours what may take an expert weeks or even years. Some automated techniques exist, but as shown by the 2017 SURIEM project, they find only roughly half the cells, and disagree on half of what they find. We aim to build on the 2017 work and improve automatic analysis techniques of these neural images. We will compare the cells identified with these methods and improve them by i) setting better threshold values of criteria such as the roundness, size, and fluorescence statistics of the cells; ii) developing new statistical criteria for identifying cells; and iii) investigating correlation patterns across cells. We will validate our methods by using hand-annotated cells from two-photon imaging sets. To do that I will carefully cross-reference inferred cell locations, shapes, and fluorescence patterns with image stacks (movies) of fluorescence images, in order to identify features that may be ambiguous and to recommend ideas for resolving those ambiguities. A key point of interest is to identify differing time courses of fluorescence in different parts of the same cell.

THERAPEUTIC OLIGONUCLEOTIDE DELIVERY USING ENGINEERED EXTRACELLULAR VESICLES
Shellane Gill
Category & Time: Biochemistry & Molecular Biology, Section 3, 1:00 - 2:15 PM
Poster: 39
Mentor(s): Masako Harada

Extracellular vesicles (EVs) are nano-sized membranous vesicles released by a variety of cells into the microenvironment. They play a vital role in intercellular communication by transferring various types of biomolecular component including DNA, RNA and proteins from one cell type to another, which often result in functional effects in recipient cells associated with physiological and pathological conditions. Based on the mode of biogenesis, EVs can be classified into three broad classes (i) ectosomes or shedding microvesicles (ii) exosomes and (iii) apoptotic bodies. Recent studies have ignited significant interest in EVs by elucidating their role in intercellular communication, pathogenesis, drug, vaccine and gene-vector delivery and as possible reservoirs of biomarkers. EVs have significant potential as diagnostic and therapeutic tools due to their nanosized (50-300nm), non-immunogenic property and the capacity to protect encapsulated biomolecules from their microenvironment. This project is a prove of concept study to show engineered EVs can be used as a cargo for therapeutic oligonucleotide delivery. mCherry (a fluorescent protein) expressing minicircle will be used, which is an expression cassette containing a minimal expression component devoid of

antibiotic resistant genes and the bacterial origin of replication. These genes are only expressed in mouse pancreatic beta cells because the expression of the mCherry is under the control of MIP (mouse insulin promoter) EVs containing minicircle will be generated, after which they will be applied to show the delivery of genes to pancreatic beta cells in vitro. Finally, our work illustrates a potential new therapeutic approach for gene delivery using EVs to specific cell types.

QUANTITATIVE ANALYSIS OF THE MITOCHONDRIAL CALCIUM SEQUESTRATION AND BUFFERING SYSTEM IN ISOLATED CARDIOMYOCYTES

Hai Truong
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 42
Mentor(s): Jason Bazil

Calcium dysregulation is the main source of cardiac tissue damage and cell death during myocardial infarction (heart attack) and myocardial ischemia. Failure to maintain proper calcium homeostasis may lead to catastrophic energy failure, reactive oxygen species (ROS) generation, and activation of the CsA-sensitive permeability transition pore (PTP) ultimately leading to cell death. Inadequate blood flow to the left ventricle in the heart due to partial blockage in the coronary arteries decreases the amount of oxygen delivered to myocardial tissue resulting in an area of ischemia. Paradoxically, when oxygen is reintroduced during reperfusion, ROS formation will lead to myocardial ischemia and reperfusion (IR) injury. In understanding the process of mitochondrial calcium sequestration and buffering system, a variety of quantitative strategies were used to monitor calcium flux both inside and outside the mitochondrial matrix. In our experimental conditions, isolated cardiac mitochondria from guinea pigs were exposed to tert-butyl hydroperoxide (t-BH) and cyclosporin A (CsA) to induce ROS production or enhance the calcium retention capacity under identical conditions respectively. Preliminary results suggest calcium buffering increases under CsA treatment. In contrast, calcium buffering is weakened in the presence of t-BH. The outcome from these models will give insight to complications due to calcium overload and provide clarity to mitochondrial calcium sequestration and buffering phenomenon.

ISOLATING A CATALYTICALLY ACTIVE MONOMER FROM A HOMODIMERIC CYTOCHROME C NITRITE REDUCTASE

Ali Younis
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 43
Mentor(s): Eric Hegg, Julius Campecino

The enzyme cytochrome c nitrite reductase (ccNiR) catalyzes the six electron, eight proton reduction of nitrite to ammonium plus water. The enzyme allows for anaerobic nitrate respiration during dissimilatory nitrate reduction to ammonia (DNRA) - a pathway found in a variety of bacteria that plays a pivotal role in global nitrogen cycle. Along with nitrogenase, ccNiR is the only enzyme known capable of transferring more than 4 electrons to a single substrate making ccNiR particularly attractive for bioenergetic and mechanistic studies. Crystallographic structures of ccNiR revealed that the enzyme exists as a homodimer, with each monomer containing five hemes. Because of the complexity of performing mechanistic studies on the dimeric form of the enzyme containing 10 hemes, the isolation of an active monomer is highly desirable. Sequential addition of a discrete number of electrons to the active monomer should yield a detailed characterization of the heme cofactors and how they function in concert to store electrons at resting state and relay electrons during catalysis. Strategies are described herein for the isolation of an active monomer of ccNiR from Geobacter lovleyi. Two approaches are described: a) disruption of salt bridges and replacements of nonpolar residues at the interface with polar amino acid residues via mutagenesis and b) insertion of bulky proteins such as thioredoxin and the maltose-binding protein within a loop at the interface. Prior studies on other enzymes using dimer interface disruption have successfully yielded stable monomers, encouraging us that this approach will be successful with ccNiR as well.

THE IMPACT OF CLE-CLV1 SIGNALING ON ROOT GRAVITROPISM
Rachel Forrest
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 44
Mentor(s): Hideki Takahashi

Nitrogen (N) plays a fundamental role in plant development but is of limited biological availability in nature; thus, N-enriched fertilizers are applied to fields for crop production, a practice that can be ecologically detrimental. Since plants alter their root system architecture (RSA) to efficiently acquire nutrients from the soil, understanding the molecular regulation of RSA is one way to address this concern. N availability regulates RSA by affecting small signaling peptide (SSP) pathways. For example, severe N-deficiency induces the expression of a SSP, CLE3, which binds to the receptor-like kinase CLV1, to inhibit lateral root emergence. We hypothesize one potential target of the CLE-CLV1 signaling pathway, PHOSPHOLIPID BINDING PROTEIN 1 (PLBP1), is induced by long-distance ammonium-dependent signals, strengthening root gravitropic response (GR), another important component of the RSA control mechanisms in plants. To assess the impact of long-distance N signals on this pathway, GR and gene expression levels of CLE3 and PLBP1 were analyzed in split-root Arabidopsis thaliana seedlings grown on segmented-agar plates supplemented on one side with either nitrate or ammonium. We expect to see weaker GR overall in plbp1 and clv1 mutants and improved GR in PLBP1-overexpressing lines, correlating with levels of PLBP1 expression. We further hypothesize nitrate will weaken GR, while ammonium will strengthen GR due to repression and induction of PLBP1, respectively. Understanding the impact of the CLE-CLV1 signaling pathway on GR through connections with PLBP1 may improve our knowledge of N-driven mechanisms involved in regulation of plant RSA.

DEVELOPMENT OF NOVEL TYPE 1 DIABETES TREATMENT USING UNIQUE GENETIC ENGINEERING TOOLS
Shakhlo Aminova
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 45
Mentor(s): Masako Harada

Diabetes is a metabolic disease that results in the body not being able to produce insulin that is needed to use or store glucose. One of the main causes of type 1 diabetes (T1D) is that the immune system attacks the insulin producing pancreatic beta cells, resulting in little or no insulin production. T1D patients require regular intakes of insulin, so that their body can use or store the glucose. However, insulin therapy is not a permanent solution to the problem, there needs to be a cure to protect pancreatic beta cells from autoimmune destruction. The goal of this project is to create a construct that induces the gene expression specific to pancreatic beta cells. The classic method of genetic engineering involves restriction enzyme digestion to first cut the plasmid and introduce a new fragment by ligation using DNA ligase. This type of genetic engineering is time consuming, costly and requires extra nucleotides around target genes for restriction enzyme cleavage. In this work, we adopted the seamless ligation cloning extract (SLiCE) method to create minicircle (minimal expression vector) for developing a novel therapeutic strategy for T1D treatment which could express genes specifically in pancreatic beta-cell using tissue specific promoter. SLiCE method is applicable for SLiCE-mediated PCR-based site-directed mutagenesis (SLiP site-directed mutagenesis) which efficiently removes or introduces mutation in the vector region. Our results suggest that both SLiCE and SLiP are simple and efficient method of cloning, facilitating the generation of recombinant plasmids and mutation variables, which will contribute to a development of tissue-specific gene expression construct such as CD47 to protect beta cells from macrophage destruction.

ANAKIN-ME: COUPLED LIGAND-PROTEIN DYNAMICS
Jasmin Whitaker
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 46
Mentor(s): Alexander Dickson

Classical molecular dynamics (MD) and Quantum Mechanical (QM) MD have both been used to investigate the dynamics of bio-molecular systems for many years. Classical MD provides this more efficiently using an empirical energy function, while QM MD determines energies and electron densities through solving the Schrodinger equation. While classical MD uses fixed molecular topologies, QM MD allows us to see the formation and breakage of covalent bonds, changes in protonation and tautomerization, and shows how reactions occur. Researchers, however, have found a way to achieve QM accuracy with near-classical efficiency with the Anakin-ME (ANI) forcefield. ANI uses a neural network to predict a system's energy, given only a set of atoms and their positions. A potential called ANI-1

was then developed through ANI by being trained on a subset of GDB databases (Human Genome Databases). We used this potential to predict forces for our well-characterized host-guest system. The force from each atom propagates the system forward in time. We then can run unbinding and binding simulations to view the reactions that take place when in bounded and unbounded states. Although this is slower than classical MD, this method paves the way for more accurate simulations to be used during drug discovery. We particularly expect this method to help improve the selectivity of covalent inhibitors, by modeling covalent attachment to target and off-target proteins.

UMUC-1-TARGETING MAGNETIC RESONANCE IMAGING OF THERAPEUTIC RESPONSE IN AN ORTHOTROPIC COLON CANCER MOUSE MODEL
Romani Richardson
Category & Time: Biochemistry & Molecular Biology, Section 4, 1:00 - 2:15 PM
Poster: 47
Mentor(s): Ping Wang

Monitoring cancer progression on a cellular level through biomarkers, would aid in delivering more effective therapeutic intervention to this troubling disease. The uMUC1 tumor antigen is a biomarker expressed in colon cancer cells, that lines epithelial cell walls in response to pathogens. We are concerned with how we can forecast the progression of adenocarcinomas by targeting this biomarker using in vivo imaging methods. It is hypothesized that dual-modality molecular imaging targeting of uMUC1 can monitor chemotherapeutic response in an orthotropic murine model of colon cancer. An uMUC1-specific iron oxide nanoparticle (MN-EPPT), was synthesized for magnetic resonance imaging (MRI) and optical imaging. A scrambled peptide was synthesized for the control (MN-SCR). Cancer progression is monitored in C57BL6 mice in vivo through the accumulation of the MN-EPPT nanoparticle. The experimental group of mice underwent chemotherapy with 5-Fluorouracil, while the control group received saline solution: untreated. Ex vivo, uMUC1 expression and probe accumulation in the tumor lesions is monitored through histology. The MN-EPPT probe accumulated more than the MN-SCR probe in the uMUC1 containing cell line (MC38 muc1). In in vivo studies, the average delta-T2 in the 5-FU-treated group was reduced compared to the saline treated control group indicating lower accumulation of MN-EPPT. Ex vivo fluorescent imaging demonstrated reduced MN-EPPT probe accumulation in the 5-FU-treated group compared with the saline treated control group. Our data demonstrated that changes in uMUC1 expression can be utilized to measure chemotherapeutic response to colon cancer treatment in vivo through using MN-EPPT-enhanced MRI and optical imaging.

CHARACTERIZATION OF GROWTH PARAMETERS BETWEEN ENTERIC PHAGES AND THEIR HOSTS
Vanessa Eaton
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 50
Mentor(s): Kristin Parent

Bacteriophages, also known as phages, are viruses that infect their host bacteria cells. They are recognized to be one of the most bountiful microorganisms on Earth who inhabit complex microbiomes such as the human gut, soil, and aquatic environments. In addition to inhabiting these complex microbiomes, phages go through rapid co-evolution alongside their hosts. The combination of co-evolution and complex habitats make it difficult to understand how bacteriophages and their hosts behave when together. This project aims to collect data regarding how many bacteriophages it takes to kill a whole population of bacteria, how many phages per cell is produced, and the rate of bacterial cell lysis. This information will be collected by implementing experiments including multiplicity of infection, burst curves, and population growth assays. Eventually, the results will be entered into a database that will be able to predict phage-host interaction while also taking into consideration different parameters such as temperature, available nutrients, and phage-host combinations. This will be accessible to the public but most useful for people working in agriculture, food safety, and medicine. Currently, the project is being performed on lab made samples of Shigella flexneri, Salmonella enterica, and Escherichia coli bacteria; as well as P22, Sf6, Cus-3 and Sf25 phages. Soon samples will be collected from local phage isolates in Michigan to eventually increase the number of species being tested on.

DETERMINATION OF VENTRAL TEGMENTAL AREA INFLAMMATORY SIGNALING IN MOUSE MODELS OF DEPRESSION
Minerva Rodriguez
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 51
Mentor(s): Michelle Mazei-Robison

Major depressive disorder (MDD) continues to affect our society as antidepressant drugs, the most common treatment for MDD, are ineffective in 30% to 50% of depressed patients. Therefore, the development of novel antidepressant is needed, highlighting the demand for research to better understand the biological mechanisms underlying depression. Dysregulation of the brain reward system has been linked to depressive-like behaviors. More specifically, mouse studies using either chronic physical (PS) or emotional stress (ES) implicate changes in dopamine neuronal activity in the ventral tegmental area (VTA). More recently, inflammation has also been suggested as an important contributor to depression. However, it is currently unclear whether changes in inflammatory signaling occur in the VTA. To further investigate the relationship between inflammatory processes and MDD, the aim of my study is to determine whether the expression of inflammatory signaling genes are altered in the VTA of PS and ES mice. I will measure the expression of pro-inflammatory genes such as IL-1B, IL-6, and TNF-a, and anti-inflammatory cytokines like IL-10 in the VTA of control, PS and ES mice using RT-PCR. Excitingly, my preliminary data indicate that expression of the pro-inflammatory cytokine IL-1B is significantly increased in PS mice. Additionally, the expression of IL-1B was negatively correlated with the social interaction score suggesting increased Il-1B expression in more "depressed" mice. These findings indicate that an increase in inflammatory signaling in the VTA may be linked to depressive-like behavior and that further investigation may lead to a better understanding of the biological mechanisms underlying MDD.

REDOX MODULATION OF FOSB OLIGOMERIZATION AND FUNCTION
Colin McCornack
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 52
Mentor(s): Alfred Robison

Neurodegenerative diseases or exposure to drugs of abuse can alter the reduction/oxidation balance within brain cells (redox state), but the mechanisms by which redox state controls gene expression in neurons is not well understood. Many neurons critical for such activities as memory, mood, and motivated behaviors orchestrate expression of select critical genes through the transcription factor *FosB*, a stable splice variant of the *FosB* gene. In controlled *in vitro* conditions, critical protein-protein interactions and DNA binding are modulated by the existence of redox-sensitive disulfide bonds between cysteine residues on *FosB* and binding partners, as well as through redox-sensitive conformational changes in *FosB* driven by the same cysteine residues. The long-term goal of this project is to assess how redox state impacts the transcriptional function of *FosB*, including formation of protein-protein interactions, binding to DNA, and expression of target genes. We generated mutant *FosB* expression vectors through PCR mutagenesis, causing alterations at the key cysteine residue (C172) to mimic (tryptophan, C172W) or prevent (serine, C172S) oxidation. These vectors were then expressed in Neuroblastoma 2a cells, and expression was confirmed via Western blot. We now plan to assess protein-protein interactions via immunoprecipitation and Western blot and the transcriptional activity of these mutant proteins through a luciferase reporter assay. Data from these experiments will inform future studies using viral vectors expressing these same cysteine mutants in mouse brain to assess the importance of this "redox switch" in murine models of drug addiction and Alzheimer's disease.

THE ROLE OF THE TSPO IN MITOCHONDRIAL FUNCTIONING
Mariia Mikhova
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 53
Mentor(s): John LaPres

Introduction: The translocator protein (TSPO) has been the focus of extensive research. In mammalian cells, TSPO is located in the outer membrane of the mitochondria; however, we still do not know its endogenous function. TSPO is highly upregulated during neuroinflammatory events, especially in microglial cells, suggesting a role in pathological conditions, such as Alzheimer's and Parkinson's disease. Our laboratory noticed that many endogenous metabolites linked to TSPO function (e.g. cholesterol and heme metabolites) are also putative ligands for the aryl hydrocarbon receptor (AHR). The AHR is a ligand-activated transcription factor that responds to various endogenous (e.g. heme and tryptophan metabolites) and exogenous (e.g. 2,3,7,8-tetrachlorodibenzo-p-dioxin) chemicals. Recently, we have determined that a portion of the AHR is found in the mitochondrial intermembrane space. The co-localization and their

shared putative endogenous ligands led to the Hypothesis: Crosstalk between the AHR and TSPO within the organelle regulates mitochondria function via changes in electron transport chain activity. Methods/Results: We have genetically engineered TSPO-deficient cells using CRISPR-Cas9 in BV2 cells, a murine microglial cell line. We have conducted cell viability, gene expression, and mitochondrial functional assays in wild type and TSPO-deficient cells in the presence and absence of ligands for the AHR and TSPO. Conclusion: Our results suggest that loss of TSPO compromises cellular energetics, slows cell growth, and protects the cells from oxidative stress. These results suggest that modulating the cross-talk between the AHR and TSPO in mitochondria can alter microglial activity.

INVESTIGATION OF SERUM AND GLUCOCORTICOID-REGULATED KINASE 1 INHIBITION AS A POTENTIAL THERAPEUTIC APPROACH FOR DRUG ABUSE
Anapaula Themann
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 54
Mentor(s): Michelle Mazei-Robison, Vedrana Bali

Drug abuse is one of the most prevalent psychiatric disorders in the US. Addiction is thought to result from altered signaling in the brain's mesolimbic dopamine circuit. However, the specific molecular changes that occur within this circuit remain unclear. Previous work in our lab has identified an increase in the phosphorylation and activity of serum and glucocorticoid-inducible kinase 1 (SGK1) in the ventral tegmental area (VTA) of mice following chronic drug exposure. Furthermore, behavioral studies from our lab indicate that decreasing either VTA SGK1 phosphorylation or activity is sufficient to decrease drug reward, suggesting that SGK1 inhibition may serve a novel therapeutic treatment for drug abuse. To test this hypothesis more directly, I will utilize two approaches. First, I will characterize the *in vivo* activity of the SGK1 inhibitor GSK3650394. While this drug has been studied in cell culture, its ability to decrease SGK1 activity in mouse brain and peripheral tissues is unclear. I will analyze SGK1 phosphorylation and catalytic activity from mouse tissues by Western Blot to determine whether systemic administration of this inhibitor is sufficient to decrease SGK1 activity. Second, I will monitor oral morphine consumption in mice that overexpress a catalytically inactive SGK1 mutant (K127Q) in the VTA. Our preliminary data indicate that this mutant is sufficient to decrease cocaine reward and we predict that it will also decrease oral morphine preference and intake. Together, these studies will characterize how SGK1 activity may influence drug behavior, a critical step in the development of novel treatments for addiction.

NEUROTENSIN RECEPTOR-1 DEFICIENCY INCREASES RISK FOR ANOREXIA NERVOSA-LIKE BEHAVIORS
Sydney Pauls
Category & Time: Biochemistry & Molecular Biology, Section 5, 1:00 - 2:15 PM
Poster: 55
Mentor(s): Gina Leinninger

Anorexia nervosa (AN) has the highest mortality rate of any psychiatric illness but there are no effective medications to improve body weight. Determining the genetic risk factors that interact with sex and stress to promote AN is necessary to identify biological pathways for intervention. Recently, loss-of-function variants in the neurotensin and neurotensin receptor 1 (NTSR1) genes were linked to the risk of having AN. We hypothesized that NtsR1deficiency is a genetic risk factor that interacts with environmental risks to increase vulnerability to develop AN. To investigate this hypothesis, we studied mice with intact NtsR1 (NtsR1++) and mice lacking NtsR1 (NtsR1-null). NtsR1-null mice of both sexes have lower body weight relative to NtsR1++ mice, suggesting that deficiency of NtsR1 predisposes for lower body weight. Additionally, female NtsR1-null mice exhibit lower feeding along with stereotypic, obsessive-compulsive behaviors associated with AN, suggesting that NtsR1 deficiency alone may enhance risk for AN in females. Moreover, when NtsR1++and NtsR1-null mice were exposed to environmental risk factors thought to promote development of AN (adolescent isolation stress and brief diet-like caloric restriction), female NtsR1-null mice exclusively displayed self-inflicted aphagic behavior that is the core feature of AN. Female NtsR1-null mice also exhibited alterations in hedonic and motivated food responding as well as excessive exercise and OCD-like co-morbidities similar to those observed in AN. These data collectively suggest that NtsR1deficiency increases vulnerability to develop aberrant behaviors associated with AN.

INVESTIGATING THE SYNTHESIS OF A CHLOROPLAST-SPECIFIC UNUSUAL FATTY ACID
Montgomery Smith
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 58
Mentor(s): Christoph Benning, Patrick Horn

Photosynthesis is the natural biochemical conversion of sunlight into chemical energy. The photosynthetic thylakoid membranes within chloroplasts are comprised of galactolipids and the phospholipid phosphatidylglycerol (PG). The unusual fatty acid, 16:1$^{\Delta D3trans}$ (16:1t), is synthesized by FATTY ACID DESATURASE4 (FAD4) and found only in chloroplast PG. We determined that, in *Arabidopsis thaliana,* 16:1t synthesis requires both FAD4 and a thylakoid-associated redox protein, PEROXIREDOXIN Q (PRXQ). To determine the role of PRXQ in 16:1t synthesis we are utilizing genetic and biochemical approaches in Arabidopsis and *Saccharomyces cerevisiae* (yeast). In spite of yeast lacking chloroplasts and containing a different lipid composition, we determined that only when FAD4 and PRXQ are both co-expressed did we see *trans* fatty acid accumulation in the endogenous lipids. Furthermore, we have multiple pieces of evidence that link 16:1t amounts to copper availability through a putative copper chaperone. Our current hypothesis is that FAD4 may require a disulfide bond between monomers to form an active dimer form of the enzyme, which is catalyzed by PRXQ, and some form of reactive oxygen species. Understanding the connection between different redox pathways and 16:1t synthesis will help further describe the synthesis and role of 16:1t in plants and enable future experiments engineering the photosynthetic membrane for improved agricultural production and sustainability.

PAROXETINE INHIBITS DEGRANULATION OF MAST CELLS TO IGE/ANTIGEN
Rithvik Nellutla
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 59
Mentor(s): Hariharan Subramanian, Elahe Crockett-Torabi

Introduction: Mast cells are one of the key mediators of hyperactive allergic responses. One of the mechanisms by which allergies can be prevented is by inhibiting mast cell activation pathways that lead to their degranulation (release of inflammatory granules). Previous work from Subramanian laboratory has shown that an adaptor protein, G protein coupled receptor (GPCR) kinase 2 (GRK2) promotes mast cell activation and degranulation by IgE/antigen. Paroxetine, which is a GRK2 specific antagonist, is a selective serotonin reuptake inhibitor (SSRI) drug that is FDA approved for treating depression. The objective of this study is to test whether paroxetine can inhibit mast cell degranulation response. Method: A human mast cell line (LAD2) was sensitized with biotin-IgE and activated with various concentrations of streptavidin (antigen) in presence or absence of paroxetine (25 μM). Cortistatin-14, which stimulates mast cells via a GPCR (MrgX2) was used as the control stimulant because it functions independently of the GRK2 pathway. Results/Conclusion: Paroxetine displayed significant inhibition of mast cell degranulation induced by IgE/streptavidin. However as expected, it did not have any effect on Cortistatin-14-induced degranulation. This leads us to believe paroxetine is an effective inhibitor of IgE/antigen-induced degranulation of mast cells and could possibly be repurposed for treating allergic diseases. Support: R.N. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett.

INTERACTIONS OF PHYLLOSPHERE MICROBIAL COMMUNITIES OF THE BIOENERGY CROP SWITCHGRASS
Maria Nunez
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 60
Mentor(s): Ashley Shade, Keara Grady

One solution to the harmful effects of fossil fuels is the use of biofuels. Switchgrass (*Panicium virgatum*) is a promising lignocellulosic biomass crop that is native to the U.S. and can grow on marginal land. Much current research investigates the effects of microorganisms living in the rhizosphere and phyllosphere of the plant. Historically, knowledge of the phyllosphere microbiome has lagged behind knowledge of the rhizosphere microbiome because the crucial task of nutrient uptake occurs in the rhizosphere. Switchgrass makes for an excellent target species toward furthering knowledge of phyllosphere microbes because of their long leaves with large surface areas. Microbiota of the phyllosphere have been shown to support increased yield and stress tolerance for the plant, as well as play a role in biofuel conversion efficiency. In order to improve biofuel production, we are interested in the phyllosphere plant-microbial interactions of switchgrass. In order to understand the diversity and functions of switchgrass microbes, we characterized the phyllosphere isolate collection gathered from 2016 GLBRC switchgrass plots, we sequenced the 16S rRNA genes of the isolates for taxonomic identification and determined their phylogenetic relationship, we investigated

the interactions between isolates by developing and optimizing high-throughput plate-based assays, and we examined how the microbial interactions changed with the presence of plant products. Through understanding and manipulating the phyllosphere microbiome, we hope to improve switchgrass growth and biofuel outputs.

THE ROLE OF DLK1 FROM OX-DLK1 NEURONS IN REGULATING PHYSIOLOGY
Tatiyana Harris
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 61
Mentor(s): Gina Leinninger, Raluca Bugescu

Orexins (OX) are neuropeptides expressed exclusively in the lateral hypothalamic area (LHA) of the brain. Approximately half of all mouse OX neurons contain the protein delta-like 1 homolog (DLK1), referred to as OX^{-DLK1} neurons. While OX neurons as a whole regulate anxiety, energy homeostasis and reward processing, it remains unclear how DLK1 contributes to these functions. We hypothesize that DLK1 is important for OX^{-DLK1} neurons in regulating anxiety, energy balance and reward processing. To assess the function of DLK1 via the OX^{-DLK1} neurons, adult $DLK1^{flox/flox}$ mice were injected in the LHA with either AAV-GFP (Control mice with intact DLK1) or AAV-Cre-GFP to enable Cre-mediated deletion of DLK1 selectively from the OX^{-DLK1} neurons (DLK1-Null mice). In a pilot cohort we observed that DLK1-Null mice had significantly reduced anxiety. To verify this, we are examining additional mice via a battery of stress and anxiety tests (elevated plus maze, forced swim test, open field testing, and foot shock) to verify if lacking DLK1 in OX^{-DLK1} neurons can reduce general anxiety. Additionally, we will study the feeding behavior, activity, and body composition of Control and DLK1-Null mice, which will reveal if DLK1 from OX^{-DLK1} neurons is also important for metabolic regulation. Finally, we are testing the mice via sucrose preference and amphetamine-induced locomotor activity to determine if OX^{-DLK1} neurons mediate reward behaviors. The data will reveal the role of DLK1 signaling via OX^{-DLK1} neurons, and provide mechanistic insight into how the novel subpopulation of OX^{-DLK1} neurons contributes to physiology.

OPTIMIZATION OF LC/MS ANALYTICAL METHODS FOR THE CHARACTERIZATION OF METABOLIC PROFILE OF SWITCHGRASS CULTIVARS
Carlye Szarowicz
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 62
Mentor(s): Anne-Sophie Bohrer, Anthony Schilmiller, Arthur Jones, Hideki Takahashi

Research on bioenergy crop production on marginal lands is important for environmentally sustainable production of biofuels and bioproducts. Switchgrass (Panicum virgatum), a potential lignocellulosic bioenergy crop species, is a native North American prairie grass with a range of genetic diversity, environmental adaptability, and high biomass yield. In this study, we focused on metabolite profiling of four cultivars of switchgrass: two upland cultivars (Summer and Dacotah) and two lowland cultivars (Alamo and Kanlow). Upland cultivars can survive cold winters in the northern U.S. but have lower biomass yield because of their early flowering traits. Lowland cultivars, however, accumulate more biomass and are resistant to drought and high temperatures, but are less tolerant to freezing conditions. The long-term goal of this collaborative project is to identify genetic traits of switchgrass (cold and drought tolerance, flowering time, nitrogen use efficiency) that are associated with changes in metabolism and to understand the relevance of plant-microbiome interactions that optimize water and nitrogen use efficiency, thus enhancing switchgrass productivity on marginal lands. To this end, our group began working on characterizing the metabolite profiles of switchgrass cultivars under stressed conditions and studying how these changes can affect plant-microbiome interactions. To implement this, switchgrass cultivars were grown in soil with or without nitrogen supplementation, and metabolites extracted from roots and shoots were analyzed by LC/MS. The methods for metabolite extraction, purification, and mass spectrometry analysis were optimized for further studies using field-grown switchgrass samples.

EXPRESSION OF BACTERIAL MICROCOMPARTMENT SHELLS IN ZYMOMONAS MOBILIS
Julie Starkey
Category & Time: Biochemistry & Molecular Biology, Section 6, 1:00 - 2:15 PM
Poster: 63
Mentor(s): Cheryl Kerfeld

As the need for sustainable and economically feasible biofuels continues to grow, different sources of bioproducts are currently being investigated. Isoprenoids are organic compounds that can be utilized for not only biofuels but also pharmaceuticals and cosmetics. Its precursors, isopentenyl diphosphate (IDP) and dimethylallyl diphosphate (DMADP), are synthesized via the methylerythritol phosphate (MEP) pathway in prokaryotes and plants. To optimize the pathway,

we are studying the effect of scaffolding enzymes inside engineered bacterial microcompartments (BMCs). BMCs are protein organelles found in a variety of bacteria and possess a range of metabolic processes depending on the types of enzymes it encapsulates. With their unique ability to self-assemble and sequester biochemical reactions, BMCs are poised to be a useful tool in biotechnology. This project aims to express synthetic BMCs in Zymomonas mobilis, an industrially pertinent bacterium that naturally lacks this organelle. A plasmid vector containing BMC shell genes will be transformed into Z. mobilis. Verification of the transformation, expression of the proteins and presence of BMC shells can be tested through antibiotic selection, SDS-PAGE protein detection and visualization using transmission electron microscopy, respectively. Once BMCs are successfully expressed in Z. mobilis, the enzymes of the MEP pathway can be introduced to study the effect of compartmentalization on the production of IDP and DMADP. If flux through the MEP pathway is improved using BMCs as a scaffold, downstream isoprenoid production may become more sustainable and efficient than traditional methods.

CHARACTERIZATION OF NOVEL HOMOLOGS TO THE C-TERMINAL DOMAIN OF THE ORANGE CAROTENOID PROTEIN

Derek Wei
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 66
Mentor(s): Cheryl Kerfeld, Han Bao, Maria Agustina Dominguez Martin

The cyanobacterial photoprotective mechanism is primarily officiated by the orange carotenoid protein (OCP). The OCP is photoactivated under blue-green light and high white light allowing it to attach to cyanobacterial light harvesting antennae - phycobilisomes. This diverts excess photosynthetically absorbed energy to be given off as heat. The OCP is a modular protein consisting of two domains: the N-terminal domain (NTD) and C-terminal domain (CTD). In addition, a carotenoid involved in the photoprotective mechanism spans the interior of both domains. Recently, a new family for homologs to the NTD were described as the Helical Carotenoid Proteins (HCPs). Similarly, Homologs to the CTD were classified as such (CTDHs). Both families have the ability to bind carotenoids. While the HCP is unique in cyanobacteria, the CTDH contains the nuclear transport factor 2 (NTF2) fold, which is ubiquitous. Bioinformatics revealed new NTF2-fold containing proteins in the model cyanobacteria *Fremyella diplosiphon* and in the model algae *Chlamydomonas reinhardtii*. Structural analysis suggested the conservation of amino acids important for binding carotenoid in these proteins. The current study is investigating the carotenoid binding ability of two proteins from both *F. diplosiphon* and *C. reinhardtii*. These four proteins have been cloned with an N-terminal histidine tag and overexpressed heterologously with various carotenoids in *Escherichia coli*. These proteins have been purified through affinity chromatography and their overexpression confirmed by SDS-PAGE gel analysis. Future works include biochemical and spectroscopic characterization of the carotenoid-protein relationships.

EFFECT OF ACC DEAMINASE ENGINEERED ENDOPHYTES ON PLANT GROWTH IN DROUGHT AND HIGH SALINITY CONDITIONS

Sarah Caldwell
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 67
Mentor(s): Bjoern Hamberger, Daniel Ducat, Timothy Whitehead

Due to impending climate change related variation in rainfall, increased drought and soil salinities are predicted to become serious problems that lead to reduced crop yields from osmotic stress. In environments with high salinity and dry soil, plants respond by producing more ethylene, which engages regulatory pathways leading to premature senescence. Beneficial microbial endophytes are thought to increase the stress tolerance of plants in part by modulating signals from the ethylene pathway. For example, endophytes inside the roots of plants are known to secrete the enzyme ACC deaminase (ACCD), which converts 1-aminocyclopropane-1-carboxylate (ACC), the precursor to ethylene, into ?-ketobutyrate and ammonia. The degradation of ACC reduces the formation of ethylene, thereby delaying the onset of senescence. We seek to import efficient ACCD genes into endophytic bacteria that lack this pathway. Optimized ACCD genes from bacteria and fungi will be inserted into endophytic bacteria taken from grass roots. Brachypodium distachyon, a model grass species, will be inoculated with these bacteria to compare growth to a control plant. Another focus is to identify as many transformable endophytes as possible. This will be done by collecting root samples of common grasses, harvesting bacteria, sequencing for identification, and screening for ACCD activity. ACCD genes from numerous sources will be either amplified from culture or synthesized, then assembled and inserted into endophytic grassroots bacteria. Then these bacteria will be tested on B. distachyon to show increased growth. If such engineered endophytes confer additional stress tolerance onto B. distachyon, this technique may be a useful approach to boost crop yields, especially in developing countries and other areas where irrigation practices are difficult.

DIVERSITY AND HETEROGENEITY OF NUCLEOTIDE-DERIVED SECOND MESSENGERS IN BACTERIA AND VERIFICATION OF THE NOVEL MESSENGERS C-DI-UMP AND CUMP
Nils Benning
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 68
Mentor(s): Christopher Waters

Bacteria use nucleotide-derived second messenger signals to respond to variations in the environment. These signaling pathways regulate numerous bacterial behaviors including central metabolism, motility, development, and natural competence. Despite increasing interest in second messenger signaling, little is known about the pathways utilizing these second messengers. The second messengers studied come in two forms: cyclic mononucleotides like cAMP, which serves as an important central-metabolism regulator and cyclic dinucleotides like c-di-GMP, which has been shown to regulate biofilm formation and motility. We seek to address two major questions regarding these nucleotide-derived second messengers: 1) the diversity of second messenger signals across the bacterial phylogenetic tree, and 2) the degree of heterogeneity of these signaling nucleotides in select bacterial species. Liquid chromatography tandem mass spectroscopy (LC-MS/MS) is used to quantify the concentration of eight distinct signaling molecules from a wide range of gram-negative and gram-positive bacteria. From the second messenger screen we have identified cyclic di-uridine monophosphate (c-di-UMP) and cyclic 3′,5′-uridine monophosphate (cUMP) to have high concentrations in most of the organisms analyzed. We verified these results by growing bacteria high in these compounds on minimal media containing [C13] D-glucose and extracting the second messengers in the same way we did when screening for the other second messengers. LC-MS/MS was used to verify if the molecular weight of the carbon-13 labeled messenger matches the expected value of the unlabeled second messenger.

MACHINE LEARNING TO PREDICT EXPERIMENTAL PROTEIN-LIGAND COMPLEX STRUCTURES
Sarah Walworth, Hyunji Kim
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 69
Mentor(s): Kenneth Merz

The main focus of this project is to use machine learning to improve the ability to find correct poses for protein-ligand binding, which will aid in future drug design. Given 795 protein-ligand crystal structures, we will generate 100 "decoy" ligand poses per protein. These simulations are created using Schrodinger's Glide docking package. After generating the decoys, a scoring function will be applied to determine the correct ligand pose. We will then employ random forest machine learning to optimize the ability to predict poses that are close to the native crystal structure. This plays a major role in drug design because the user can take the initial structure and find a molecule that will fit into the pocket, for example, a molecule that inhibits schizophrenia by docking to serotonin receptors. In the future, we hope that this algorithm can optimize predictions for other data sets.

SELECTION FOR NOVEL BACTERIA WITH AN ABILITY TO DEGRADE DIOXINS
Gabrielle Huizinga
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 70

Dioxin compounds are highly toxic and naturally occurring (i.e. ball clay, and prairies) or produced through anthropogenic activities (waste incineration, and industrial activities). Currently, there is only one organism in pure culture (Sphingomonas wittichiiRW1) that can utilize dioxin compounds as its sole carbon and energy source. Therefore, we presume there are other microbes that can utilize dioxin compounds. Isolating and characterizing these organisms could help with bioremediation of affected areas. Soil/ water samples from prairies, near clay mines, and compost piles were taken and enriched with dibenzo-p-dioxin (DD) for three years. The enrichments were then subsequently diluted to isolate rapid growing organism(s) capable of utilizing dioxins as their sole carbon and energy source. Once the enrichments showed signs of growth, steps to isolate the organisms took place. Diluted enrichments were spread onto low nutrient plates and individual colonies were inoculated into small volume (2 mL) of low nutrient media. Once grown, the isolates were placed into small volume (2 ml) of minimal media and dioxin compounds as the sole carbon source. Once confirmed that the organisms can utilize dioxin compounds, the organisms were grown in high nutrient media to obtain a large sample for extracting genomic DNA. Post DNA extraction, 16S rDNA and whole genome DNA sequencing will take place. These sequences will help with characterizing and understanding the organism(s)' metabolism of the toxic dioxin compounds.

INHIBITION OF MITOCHONDRIAL METABOLIC ENZYMES BY GLOBAL ISCHEMIA-REPERFUSION INJURY ON C. PORCELLUS CARDIOMYOCYTES
Matthew Vanderploeg
Category & Time: Biochemistry & Molecular Biology, Section 7, 1:00 - 2:15 PM
Poster: 71
Mentor(s): Jason Bazil

Mitochondria are the most prominent source of ATP in cells. Multiple catabolic pathways converge and shuttle electrons to the electron transport chain (ETC) creating a membrane potential driving the synthesis of ATP. Slight alterations to the membrane potential provoke significant production of reactive oxygen species (ROS) as seen during ischemia/reperfusion injury (IRI). In this study, we uncover the degree of in vivo oxidative damage to critical metabolic enzymes induced by ROS production through IRI with a working heart model. The pathways of interest included the Krebs Cycle, Beta-Oxidation, Branched-Chain Amino Acid catabolism, ROS scavenging system, and the ETC. IRI significantly reduces enzyme activity in both the Krebs cycle and Complexes I and II of the ETC. The decreased activity of Complexes I and II suggest that IRI limits the influx of electrons through the oxidation of electron carriers (NADH and FADH2). Additionally, the decreased activity of some key Krebs Cycle enzymes limits the supply of reduced electron carriers for the ETC. Thus, in vivo oxidative damage caused by IRI impairs the mitochondria's ability to generate reduced and subsequently oxidize electrons carriers decreasing its ability to synthesize ATP.

SELECTIVE LIGNIN LINKAGE CLEAVAGE VIA VOLATILE TRIALKYLAMINE REACTIVE PERCOLATION
Ellis Dwayne Moore Jr.
Category & Time: Biochemistry & Molecular Biology, Section 1, 1:00 - 2:15 PM
Poster: 72
Mentor(s): Mikhail Redko, James Jackson

Petroleum is the basis for todays chemicals and liquid fuels. Processing and combustion of this finite fossil resource adds the greenhouse gas, carbon dioxide (CO2), to the atmosphere. To reduce net CO2 emissions, biomass, the sole source of renewable carbon, is under active study as a replacement for petroleum. To enable processing, biomass is typically liquified to bio-oil by fast pyrolysis (rapid heating to 500-600 C without oxygen). However, the high energy intensity of pyrolysis and related biomass conversions offsets the benefits of shifting to renewables. An alternative approach is saturation of biomass with a water/trialkylamine mixture and heating to 150-200 C to hydrolyze the lignin fraction, breaking it down to small-molecule aromatic fragments. The resulting dissolved lignin digestate can then be extracted from the cellulosic solids by filtration and converted to biobased product precursors. This process depolymerizes Lignins complex structure without harmful solvents at modest energy intensity. Optimization of the phase separations through reactor test for the recapture of solvent. Recovered solids contain mostly cellulose and hemicellulose with potential as fermentation feedstocks. Selective cleavage of the Lignin can be proposed as heteronuclear single quantum correlation 2D NMR spectroscopy can suggest that Lignin is depolymerized and undergoes condensation. Such intermediates, produced from renewable biomass by hydrolysis and disproportionation, may in turn be converted via conventional processes into polyethers and nylons, products made today from petroleum.

BIOSYSTEMS AND AGRICULTURAL ENGINEERING

SOLUBLE PHOSPHORUS SORPTION FROM TILE DRAINAGE
Thiramet Sotthiyapai, Jessica Hauda
Category & Time: Biosystems & Agricultural Engineering, Section 1, 1:00 - 2:15 PM
Poster: 74
Mentor(s): Steven Safferman

Soluble phosphorus is a cause, in part, for eutrophication in freshwater environments, which impacts tourism, human health, environmental safety, and property value. Phosphorus (P) is also a non-renewable resource, projected to run out in 80 years at its current consumption rate. P is valuable to agriculture because it is a necessary nutrient that promotes crop growth. About 90% of P is used in the global food chain, mainly as fertilizer. Drawing upon recent studies, this research objective entails selecting the material best suited for removing and recovering P from tile drain water in Michigan corn fields. P sorption media selected from the previous literature and experience include engineered nanomaterials, biochar, and natural materials. These media will be tested for adsorption isotherms using synthetic tile drain water and column studies to verify the capacity and size of the system required for each media. Properties of nutrient in tile drain water from typical Michigan's cornfield and climatic data were set as standard conditions to simulate tile drain effluent. The tile drain water will be tested with HACH Company test kits and a spectrophotometer for

soluble phosphorus, total phosphorus, and nitrogen. Ultimately, a Techno-Economic Analysis (TEA) will be conducted to assess the benefit and cost of each P absorption materials.

IMPROVING DRAINAGE WATER QUALITY: SATURATED BUFFERS
Megan Beaver
Category & Time: Biosystems & Agricultural Engineering, Section 1, 1:00 - 2:15 PM
Poster: 75
Mentor(s): Ehsan Ghane

Subsurface drainage plays a vital role in agriculture, which is an essential part of the economy in Michigan. However, since subsurface drainage removes excess water from the farm, it also allows nutrients to be more easily transported to surface water, which can cause water quality issues such as eutrophication and harmful algal blooms. A relatively new conservation practice to combat the unintended environmental impacts of subsurface drainage is a saturated buffer, in which drainage water is diverted into the soil that runs along the length of the drainage ditch, so that water can flow through the natural filter of the soil before flowing into surface water. As this is a fairly new practice, there is little research in the area, especially related to phosphorus removal. However, there is believed to be a potential for phosphorus removal if the buffer vegetation is harvested. Research is being done in the Western Lake Erie Basin to quantify the effectiveness of saturated buffers in reducing the load of nitrates and phosphorus reaching surface water, improving water quality in the drainage ditch, which will eventually flow into Western Lake Erie.

BERRY PHENOLICS AND THEIR ANTIOXIDANT ACTIVITY AGAINST CHOLESTEROL OXIDATION
Matthew Schweiss
Category & Time: Biosystems & Agricultural Engineering, Section 1, 1:00 - 2:15 PM
Poster: 76
Mentor(s): Ilce Medina Meza

Studies have shown an inverse relation between fruit intake and chronic diseases. This effect is often attributed to the fruits phytochemicals, specifically its phenolic compounds. These phenolic comounds possess antioxidant properties that can be potent against lipid oxidation. Montmorency cherry (*Prunus cerasus*), blueberry (*Vaccinium virgatum* and *Vaccinium corymbosum*), strawberry, raspberry (*Rubus idaeusi*) and cranberry (*Vaccinium macrocarpon)* powder were extracted using methanol followed by a solid phase extraction to separate the sub-sets of phenolic compounds. Low density lipoprotein (LDL) is a lipoprotein that carries cholesterol from the liver to cells where it is used to produce hormones and enhance the fluidity of the plasma membrane. LDL and its oxidized form also plays a crucial role in the pathogenesis of atherosclerosis. Oxidized LDL accumulates in blood vessel walls where it is then engulfed by macrophages forming the foam cells and the necrotic center of an atherosclerotic plaque. In this study, the effects of berries and their different phenolic compounds against LDL and large unilamellar vesicle (LUV) system oxidation are being investigated. The isolated fractions will be profiled by HPLC-DAD. LDL and liposomes (LUVs) systems will be incubated with the different fruit fractions as well as with different radical initiators and its oxidation will be monitored. GC-MS and HPLC will be used to measure the cholesterol oxidation products formed, indicative of the extent to which the LDL has oxidized.

UNDERSTANDING THE EFFECTS OF FLUSHING ON WATER QUALITY IN DETROIT HOMES AFTER PROLONGED PERIODS OF NON-USE
Esha Jain
Category & Time: Biosystems & Agricultural Engineering, Section 1, 1:00 - 2:15 PM
Poster: 77
Mentor(s): Jade Mitchell-Davis, Jennifer Carrera

A major concern with water supply is that the drinking water can be contaminated due to the premise plumbing and water distribution sites being shut off or a lack of consumer use for various reasons including conservation. To address this concern, a citizen science project through the MSU Water Network Water Cube program was conducted to better understand these effects. Community researchers took water samples from 34 homes in Detroit, Michigan to analyze the chemical components and microorganisms. Additionally, the homeowners completed surveys to add more information about the building construction and water usage. The water samples were collected from each home at three different times, when the faucet was initially turned on, 2.5 minutes later, and 10 minutes after that. These samples were taken to the Department of Environmental Quality (DEQ), where tests were run to discover what chemicals were present in each sample. Many chemicals were tested for, including, minerals, iron, lead, and disinfection byproducts. In this study, the data collected was compared across the 0, 2.5 minute, and 10 minute mark in each house for levels of lead and certain disinfect byproducts. The results of this analysis across the households is ongoing.

ANALYSIS OF THERMAL CONVERSION PROPERTIES OF BIOSOLIDS
Matthew Wholihan
Category & Time: Biosystems & Agricultural Engineering, Section 1, 1:00 - 2:15 PM
Poster: 78
Mentor(s): Steven Safferman

Biosolids can be converted into bio-oil, syngas and biochar through thermal manipulation. Bio-oil and syngas have the potential for energy generation, while biochar can be land applied as a soil amendment. The thermochemical conversion processes include torrefaction, pyrolysis and gasification. Each procedure produces a different amount of bio-oil, syngas and biochar, making the advantages of each method different. The feasibility of thermal conversion of biosolids was evaluated through three experimental methods. The first process, thermogravimetric analysis (TGA), was performed to investigate the mass decomposition characteristics of the biosolids at different temperatures. The mass decomposition data also provides information on the types of the compounds present in the biosolids. Next, the gases released by the biosolids under thermochemical conversion were analyzed using a pyroprobe. This experiment was useful in identifying if there was any discharge of toxic compounds under heat transformation. Finally, elemental analysis was performed on the biosolids and biochar to understand the elemental composition and heating values. Analysis was specifically done for presence of carbon, oxygen, hydrogen, nitrogen and sulfur in the biosolids and biochar. All three of these experimental procedures provide insight into the thermochemical conversion characteristics, potential toxicity, and energy conversion potential of the biosolids.

OPTIMIZATION OF BAG-IN-BOX TECHNOLOGY FOR CUCUMBER FERMENTATION
Corrine Zeeff
Category & Time: Biosystems & Agricultural Engineering, Section 2, 1:00 - 2:15 PM
Poster: 81
Mentor(s): Steven Safferman

The USDA estimates that 30 to 40 percent of the U.S. food supply is wasted. Preserving excess produce via brining adds value and diverts waste from landfills and wastewater treatment systems. Previous studies have shown that the bag-in-box technology for brining cucumbers is well suited for small quantity applications and enables a low salt process that allows the brine from fermentation to be reused in the finished product, reducing washing and preventing the production of high salt wastewater. The objective of this research is to investigate the potential implementation of the bag-in-box technology for brining cucumbers at an industrial scale for growers, processing facilities, and retailers. The aim of this particular study is to prepare an engineering design that replaces the blanching and cooling steps with a nitrogen blanket and purging system to create anoxic conditions that discourage growth of unwanted microbes and removes carbon dioxide formed during fermentation. Laboratory studies are being conducted to find the optimal rate of nitrogen flow into the bag-in-box system to purge carbon dioxide. Carbon dioxide is produced by lactic acid bacteria and cucumbers during fermentation and can cause hollow pockets within the cucumbers if levels exceed safe concentrations. The experiments use a single bag-in-box system with a carbon dioxide input to simulate the carbon dioxide produced by the bacteria and cucumbers. Two titration methods of carbon dioxide level monitoring were used with little success. Gas chromatography will be studied as a method of carbon dioxide level monitoring.

ELECTROCATALYTIC HYDROGENATION AS A METHOD FOR THE UPGRADING OF FAST-PYROLYSIS BIO-OIL
Adam Smerigan, Rachael Sak
Category & Time: Biosystems & Agricultural Engineering, Section 2, 1:00 - 2:15 PM
Poster: 82
Mentor(s): Christopher Saffron

Ethanol-based fuels are effective alternatives for curbing greenhouse gas emissions caused by the combustion of fossil fuels. However, the production of corn is unsustainable. Using bio-oil produced via the pyrolysis of second generation biomass, such as trees and grasses, cultivated on marginal land would allow for carbon sequestration and the improvement of soil through the land application of biochar, as well as, further reduced greenhouse gas emissions. Unfortunately, bio-oil produced through the fast-pyrolysis of high lignin biomass is highly corrosive and unstable making transport expensive and long-term storage impossible. Electrocatalytic hydrogenation (ECH) is a reduction method performed on the on the fast pyrolysis produced bio-oil at mild conditions. Reduction and deoxygenation upgrades fast pyrolysis bio-oil creating a stable biofuel intermediate and allows for affordable transport while, also, increasing the energy content of the bio-oil itself. In this study, a ruthenium bonded to activated carbon cloth (Ru/ACC) cathodic catalyst was used in low amperage experiments. The resulting material was then analyzed via gas chromatography and mass spectroscopy (GC/MS) to determine whether change was affected. The peaks were identified by cross referencing

with the peaks of known and suspected bio-oil compounds. Conversion of the bio-oil was observed in carbonyl compounds into simple alcohols.

THE EFFECTS OF USING FAT, OIL, AND GREASE (FOG) AS FEEDSTOCKS TO INCREASE BIOGAS PRODUCTION IN MUNICIPAL WASTEWATER ANAEROBIC DIGESTERS

Kaitlyn Nessler
Category & Time: Biosystems & Agricultural Engineering, Section 2, 1:00 - 2:15 PM
Poster: 83
Mentor(s): Dana Kirk

Anaerobic digestion is a sustainable way to create usable biogas energy using organic waste that otherwise ends up in landfills or wastewater. Our research focuses on fat, oil, and grease (FOG), which commonly comes from the food industry. Collecting FOG from restaurant grease interceptors or other large kitchens prevents it from being deposited into wastewater but can also yield benefits in anaerobic digestion. Using FOG as a feedstock can improve the biogas production, ultimately decreasing or eliminating the need for natural gas. The Department of Public Works for Kinross Charter Township has partnered with MSU ADREC to aid them in their FOG addition project to their wastewater treatment plant. Our research will determine the ideal percentage of FOG to add to their digester to maximize their biogas production and increase the sustainability of their WWTP. Our research involves lab testing on samples from their plant, experimentation on the effects of varying levels of FOG addition, and the addition of FOG to an already active WWTP. When working with FOG, several complications may occur. The scope of our research addresses complications in maintaining pH, keeping balanced levels of microorganisms, and preventing escalated foaming within the digester. By using different FOG to influent ratios, we can monitor the benefits and complications as we increase the amount of FOG added. This allows for the determination of the ideal ratio. We can use these lab results to make a recommendation for the permanent pilot design and decrease the likelihood of complication amongst their digesters.

VISUAL TEST FOR RAPID DETECTION OF INFECTIOUS DISEASES AND THEIR ANTIBIOTIC SUSCEPTIBILITY

Emma Dester, Abbigail Bugenske
Category & Time: Biosystems & Agricultural Engineering, Section 2, 1:00 - 2:15 PM
Poster: 84
Mentor(s): Evangelyn Alocilja

Correct diagnosis of patients with antibiotic-resistant disease strains is essential to effective treatment. Unfortunately, the more cost-effective methods for testing antibiotic susceptibility, such as Zone of Inhibition tests or microdilution trays, require at least one overnight incubation. Although there are also costly automated instrument systems available, detection time can still range from 3.5-18 hours, depending on the pathogen and the device used. As a result, it is virtually impossible to both determine the antibiotic susceptibility of a given pathogen and prescribe the patient the correct antibiotics in the same day. This poster will present research development on rapid disease detection utilizing the interactions between microbes and MNPs in order to visually detect the concentration of live bacteria in a sample within 10-15 minutes. Trials have resulted in successful detection of both Gram-negative and Gram-positive bacteria, viruses, and fungi. The objective of this study is to quantify and refine this detection process, in addition to utilizing this assay as a rapid and cost-effective measurement of antibiotic resistance. Preliminary testing of this method has indicated that bacterial concentration difference in antibiotic-treated *S. aureus* can be detected after as little as 6 hours of incubation. This technology has the potential to provide cheap and accurate same-day diagnosis for follow-up patient treatment.

MICROSCOPIC ANALYSIS OF GVL-PRETREATED POPLAR

Alexis Scott
Category & Time: Biosystems & Agricultural Engineering, Section 2, 1:00 - 2:15 PM
Poster: 85
Mentor(s): Cynthia Collings, Shiyou Ding

For lignocellulosic biofuels to be a sustainable alternative for petroleum, biomass utilization must be maximized. This model includes the use of multiple product streams. Gamma-valerolactone (GVL) is a biomass-derived solvent that may be used to pretreat biomass and can facilitate the separation of biomass into cellulose, hemicellulose, and lignin fractions. In this research, the effects of GVL pretreatment at 120℃, 140℃, and 150℃ after 30 minutes were investigated using various techniques in microscopy. These techniques include atomic-force microscopy (AFM), stimulated Raman spectroscopy (SRS), and fluorescence microscopy to determine cellulose accessibility with GFP labeled carbohydrate binding modules (CBM). When GVL pretreatment is optimized, lignin should be solubilized into the hydrolysate to

improve accessibility to solid cellulose. To determine the efficacy of GVL pretreatment, SRS images were taken at 889 nm and 931 nm. The intensities of these images were used to establish a ratio of lignin:cellulose in a given sample. Additionally, CBM3-GFP was used as a fluorescent label for cellulose in order to quantify the accessibility of cellulose in solid samples. AFM was used to generate a topographical image of the biomass surface in order to visualize the effect of GVL on cell wall structure.

CELL BIOLOGY, GENETICS AND GENOMICS

ROLE OF ANNEXIN A6 IN VOLUNTARY EXERCISE

Jessica Hawkins
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 88
Mentor(s): David Ferguson

Introduction: Studies have shown that undernourishment during postnatal life leads to diseases like type 2 diabetes, obesity, cardiovascular diseases and some cancers later in adulthood. There has been evidence, using a mouse model, to show that inadequate nutritional diets lead to a reduction in voluntary physical activity. Annexin A6 is a protein that can be found in the sarcoplasmic reticulum (SR) of a myofibril, and regulates the amount of calcium coming into and out of the SR so that muscles can make contractions. Thus, the purpose of this study was to identify the role Annexin A6 plays in regard to voluntary physical activity and regulation of skeletal muscle. Methods: FVB mice were undernourished in either gestation (GUN), early postnatal life (PUN), or not at all (CON). At PN45, mice were housed individually and given access to a free moving running wheel. At 70 days, the soleus was excised, homogenized, and a standard Western blot was run to identify the expression of Annexin A6 in each group of mice (N=3 males and females per group).

THE EFFECT OF EXOGENOUS PROTEIN ON BIOFILM PRODUCTION IN FISH PATHOGENS

Marceline Stevens
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 89
Mentor(s): Terence Marsh

Several bacterial diseases in both wild and farmed fish stem from the genera *Flavobacteriu* and *Chryseobacterium* within the family *Flavobacteriaceae*. Biofilm production is a known virulence factor of the species *Flavobacterium columnare*. In *F. columnare*, biofilm production is modulated by exogenous protein levels; when grown in solutions with varying milk protein concentrations, biofilm production increased as protein content rose to 1% and then decreased when greater than 1%. These investigations were designed to determine the extent of this phenotype amongst other fish pathogens. Using a cohort of 15 different *Flavobacterium* and *Chryseobacterium* species, a biofilm assay was performed in 96 well plates using crystal violet to measure the extent of biofilm formation after 48 hours of incubation with different concentrations of milk protein. Biofilm formation was compared to that of uninoculated broth (negative control) and *Pseudomonas aeruginosa* (positive control). Several different phenotypes were observed across the cohort of *Flavobacterium* and *Chryseobacterium*. Phenotype one had very low biofilm production under all conditions; phenotype two had significant biofilm production without exogenous protein but decreased with added protein, and phenotype three had low levels of biofilm without protein but increased significantly with 1% milk protein (declined above 1%). To increase the sample size, we are expanding our analysis to 35-40 strains. Increasing the number of strains and environmental variables may reveal different phenotypes. Knowing the environmental triggers for biofilm formation of fish pathogens may improve hatchery management practices.

PREDICTING GENE EXPRESSION LEVELS IN INACCESSIBLE TISSUES BASED ON DATA FROM BLOOD

Nathaniel Davis
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 90
Mentor(s): Arjun Krishnan

Measuring the expression levels of all the genes in the genome in a particular tissue sample can be illuminating about the global molecular status of the cells, and consequently, the health or disease status of the tissue. However, almost all tissues can be sampled for such analysis only postmortem; except for a few tissues such as skin, hair, and blood, which can be easily acquired at any time. Therefore, it would be incredibly advantageous to use the expression levels of all the genes (the 'transcriptome') in blood from living samples to infer other gene expressions in unobtainable tissues, such as the brain or lung. We hypothesize that the expression levels of genes in the blood may be able to accurately predict at

least a significant portion of the transcriptome in remote, inaccessible tissues. Using data from the Genotype-Tissue-Expression consortium, we explore a high-dimensional regression framework to predict expression levels of several thousand genes in each of thirty different tissues in an individual using only the gene expression levels from the same individual's blood sample. We are exploring the effect of confounding factors, while making use of a diverse pool of feature selection and dimensionality reduction techniques to account for expected correlation patterns among genes. Results show that some of these regression approaches may be promising methods in predicting unknown gene expression for a variety of important genes.

IMPUTING THE EXPRESSION OF UNMEASURED HUMAN GENES USING TISSUE-SPECIFIC SIGNALS
Jacob Canfield
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 91
Mentor(s): Arjun Krishnan

Gene expression profiling is a popular and powerful technology for measuring the activity of a large number of genes in a given biological sample. While current advances enable us to record all the genes in the human genome, past iterations of this technology have only been able to record the expression of only about half the genes. However, these partially-measured gene expression samples, more than 40,000 in total, are still extremely valuable because they correspond to a diverse range of biological sources, conditions, and disease states. Here, we are proposing a series of machine learning methods to recover the full gene expression profile in these samples based on the expression patterns of the measured genes. A key innovation of our approach is to account for the fact that genes have widely varying patterns of expression and coexpression based on the tissue of origin. We incorporate this notion by building one predictive model per gene per tissue, optimizing the hyper-parameters in each model for achieving the highest accuracy. We are also testing the effect of learning patterns based on a reduced number of meta-genes that are combinations of measured genes. In addition to imputing missing data recorded using many partially-measured platforms, the underlying models lend themselves to biologically interpreting the expression patterns that facilitate the prediction of each gene in each tissue.

HOMOZYGOSITY MAPPING IN A DOG FAMILY WITH HIGH INCIDENCE OF ISOLATED CLEFT PALATE
Nicholas Zonca
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 92
Mentor(s): Brian Schutte, John Fyfe

Cleft palate (CP) is a common birth defect in humans, affecting 1/1500 live births. As such, it is crucial to establish a reliably reproducible and relevant large animal model of CP to study the mechanism of and potential treatments for CP. The goal of the current project is to identify mutations that cause and/or suppress CP in a high CP-frequency family of dogs. Based on results of breeding experiments, we hypothesize that CP in this family is a recessive disorder but that the phenotype can be suppressed by a single dominant locus. We performed homozygosity mapping using genome-wide genotype data from 11 affected dogs to identify candidate regions of the genome that may harbor the causative allele. While homozygosity alone could indicate a region of a recessive disease allele identical by decent in an inbred population, it could also be caused by a block of uninformative SNPs. To identify uninformative regions, we compared the genotypes of 47 unaffected members of the family in the homozygous regions. There were eight homozygous blocks shared by the affected dogs that were larger than expected by random chance. However, we also observed that these eight regions were homozygous in all the unaffected animals tested, indicating that they were regions of uninformative markers. We conclude that the allele that causes CP may reside in a region that lacks heterozygosity in our dog family. Thus, mapping this allele using conventional genetic analyses will require outcrossing to a genetically dissimilar dog breed.

OREXIN NEURONS IN THE LATERAL HYPOTHALAMUS AREA
Lonsani Kabba
Category & Time: Cell Biology, Genetics & Genomics, Section 1, 1:00 - 2:15 PM
Poster: 93
Mentor(s): Gina Leinninger, Raluca Bugescu

Orexin (OX) neurons are confined to a specific brain region called the lateral hypothalamic area (LHA) and regulate diverse physiology including arousal, metabolism, reward processing and stress. Recently, the Leinninger lab found that half of the mouse OX neurons contain the protein delta-like 1 homolog (DLK1) but it is not expressed in other LHA neurons. The role of DLK1 in OX neurons, however, is unknown. To reveal the role of DLK1 in OX neuron-mediated

physiology, the Leinninger lab is using site-specific genetic tools to delete DLK1 from OX neurons. Specifically, DLK1flox/flox mice were injected in the LHA with either AAV-GFP (Control mice with intact DLK1) or with AAV-Cre-GFP to generate mice that lack DLK1 only from the LHA OX-DLK1 neurons (LHA DLK1-null mice). The goal of my project is to verify that the DLK1-deletion method specifically deletes DLK1 from the LHA, but not from neighboring areas of the brain known to contain DLK, such as the arcuate nucleus and ventral tegmental area. Brains from Control and LHA DLK1-null mice will be analyzed by immunofluorescence for DLK1 to validate that it is deleted from LHA neurons but remains in other neurons throughout the brain. Additionally, DLK1 gene expression will be assessed within the LHA and other brain regions to confirm the LHA specific deletion. Together, these data will assess whether the method for deleting DLK1 is exclusive to the LHA, which is essential for using these mouse models to reveal how DLK1 contributes to physiology.

IDENTIFYING ATRAZINE'S EFFECT ON HUMAN KERATINOCYTES

Faith Volpe
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 96
Mentor(s): Nicole Najor

Atrazine is the second most used pesticide in the United States, and the most common chemical detected in American groundwater. Despite being banned from various European countries, the EPA has deemed concentrations below 3.0 parts per billion (ppb) to be safe for use. Many studies have labeled Atrazine as a carcinogen due to the reproductive defects it causes in rats, fish, and amphibians at levels as low as 0.1 ppb. Some reports have shown that Atrazine causes mitochondrial dysfunction in human liver cells (HepG2) however, its effect on human skin cells remains understudied. The impact of this research is underscored by the fact that the skin is our first line of defense and primary means to combat toxins, ultraviolet radiation, and mechanical insults. The goal of this research is to identify whether exposure to Atrazine could promote a cancerous phenotype in human keratinocytes. To identify this effect, keratinocytes were grown in cell culture and exposed to varying concentrations of Atrazine that exceeded the EPA's standards. Immunofluorescence was employed to visualize DNA double strand breaks with the marker gamma H2AX (lH2AX), a component of the histone octamer that gets phosphorylated and recruits DNA repair proteins. We hypothesized that increasing Atrazine concentrations will induce DNA damage, indicated by an increase in lH2AX proteins. While repeat experiments are currently underway, we noted altered cell morphology and increased cell death was observed between the concentrations but lH2AX quantification. Additionally, we are investigating DNA damage through visualizing at total protein levels in known DNA damage and repair pathways through Western blotting. Future experiments will utilize the above techniques with cells exposed to the same range of concentrations alongside a positive control like Adriamycin or Hydroxyurea, drugs known to induce DNA double-strand breaks. We will also utilize assays to further characterize the alterations Atrazine induces.

CALSEQUESTRIN AND ITS ROLE IN VOLUNTARY PHYSICAL ACTIVITY

Maxwell Dodd
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 97
Mentor(s): David Ferguson

Early life has shown that undernourishment in life can cause higher risks of type 2 diabetes, some cancers, obesity and cardiovascular diseases in adulthood. Preliminary data has shown that undernutrition early in life causes a decrease in physical activity later in adulthood. Calsequestrin 1 (casq1) is a specific protein that regulates the release of calcium to the muscle. The purpose of this study is to determine if casq1 is involved with the regulation of voluntary physical activity. Three groups of mice were used for this study: postnatally undernourished (PUN), gestationally undernourished (GUN), and control (CON). At PN70, soleus was excised from mice, and homogenized with a lysis buffer. Standard western blotting procedures were then performed, and a one-way ANOVA was ran comparing the effects of undernutrition of casq1 expression.

PARALLEL TECHNIQUES FOR OPTIMIZATION OF SERES-BASED RESAMPLING OF ALIGNED SEQUENCES
Cyprian Blunt
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 98
Mentor(s): Kevin Liu

The field of biomolecular sequence analysis relies heavily upon resampling to generate statistical support for a given model. Bootstrapping, one of the most popular non-parametric approaches, resamples under an assumption of independently and identically distributed observations. But many problems in this field prove these assumptions to be insufficient. Our semi-parametric system known as SERES (SEquential RESampling) has been demonstrated to provide improved resampling and statistical support when compared with most of the current methods. Because adjoining sites in the multiple sequence alignment (MSA) must still be considered adjoining after sampling, SERES uses a random walk procedure. It moves in an arbitrary direction until a reversal event with a given probability, and this while the total number of samples is less than the MSA's length. We here propose a parallel structure whereby multiple components of the resampling procedure can occur simultaneously, specifically the sampling of characters or items in the MSA. In so doing, we aim to dramatically improve efficiency via increased throughput, and hence increased scalability, to effectively handle the ever-growing sequence datasets in today's world.

IDENTIFYING THE SIGNALING NETWORKS THAT REGULATE PHYTOCHROME-DEPENDENT GRADED GENE CONTROL OF SIGMA FACTOR 6 (SIG6) DURING PHOTOMORPHOGENESIS IN ARABIDOPSIS THALIANA
James Leon
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 99
Mentor(s): Hussien Alameldin

Elucidating the mechanisms of photosynthesis and which factors impact photosynthetic pathways in plants can contribute to a greater general understanding of these organisms and their use in a variety of applications. Nuclear-encoded proteins known as sigma factors are responsible for binding to the core plastid RNA polymerase and initiating transcription of specific chloroplast genes. In Arabidopsis thaliana, there are six known sigma (SIG) factors (SIG1 to SIG6). Both SIG2 and SIG6 have been shown to be essential components in the synthesis and accumulation of chlorophyll and involved in chloroplast development during photomorphogenesis. Previous studies have linked the reduction in the expression of SIG6 to mutations in PHYA and PHYB genes. However, an understanding of the regulatory role of SIG6 in light signaling pathways central to photomorphogenesis is limited. To better understand the specific relationship between phytochromes and SIG6, we developed double mutant A. thaliana lines carrying a sig6 gene mutation as well as mutations in different light regulator genes (i.e., phyAsig6, phyBsig6, pif4sig6 lines). Also, we developed lines with overexpression of SIG6 in light regulator mutant backgrounds. The light-dependent phenotypes and level of chlorophyll accumulation of the double mutant and overexpressing lines are being compared to single mutants and wild-type lines. Along with this analysis, we will measure the expression of SIG6 target genes. Our preliminary results showed lower amounts of chlorophyll in the double mutants of sig6phyA and sig6pif4 in both far-red and red light.

STUDYING THE ANTIMICROBIAL PEPTIDE MELITTIN'S ABILITY TO ERADICATE BIOFILMS ASSOCIATED WITH CHRONIC WOUNDS USING A WOUND MOUSE MODEL
Emily Segneri
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 100

The treatment of chronic wounds, which fail to progress through a timely reparative process, are estimated to cost $25 billion dollars annually. These wounds fail to heal due to colonization by pathogens such as *Pseudomonas aeruginosa* in the form of drug-resistant biofilms that are very difficult to eradicate and inhibit the natural healing process. In an effort to identify new therapies for these biofilm-associated wounds, we tested several antimicrobial peptides and found that melittin kills 99% of cells within mature biofilms after 6-hrs of treatment using BacTiterGlo™ cell viability assay. We also found that melittin causes biofilm dispersal after 6-hrs of treatment using a crystal violet staining. To develop this treatment further, there is a critical need to study the antimicrobial properties of melittin *in vivo*. To study melittin's properties *in vivo* we will use a wound mouse model that we previously established. This model uses an *in vivo* imaging system, offering a direct, rapid, *in situ,* non-invasive process to study biofilm killing. We will create and inoculate wounds with the bioluminescent strain of *P. aeruginosa,* Xen41. Next, we will treat biofilms formed by Xen41 with various

concentrations of melittin. We hope to determine whether melittin can be used to eradicate biofilms associated with chronic wounds, thus allowing the natural healing process to resume. Ultimately, we hope to identify and develop a new therapy for biofilm-associated wounds.

POSITIVE ALLOMETRIC SCALING OF CELL SIZE AND FITNESS IN A LONG-TERM EVOLUTION EXPERIMENT WITH ESCHERICHIA COLI
Ali Abdelmagid, Nkrumah Grant
Category & Time: Cell Biology, Genetics & Genomics, Section 2, 1:00 - 2:15 PM
Poster: 101
Mentor(s): Richard Lenski

During the 30-year long term evolutionary experiment (LTEE), 12 populations of *Escherichia coli*have been studied and analyzed as they have propagated for greater than 69,000 bacterial generations. During these 30 years, studies were carried out on fitness and it was determined to be continuously increasing. Interestingly, up until 10,000 generations, cell size also increased, contrary to what theory would predict. Having been provided with the fitness data up until 69,000 generations, my mentor and I will set out to determine if cell size has continued to increase with fitness after 10,000 generations. To this end, we will revive frozen samples of bacteria from the LTEE lines isolated from 2,000, 10,000 and 50,000 generations, and measure cell size using volumetric and microscopic methods. After collecting cell size measurements, we will integrate these data with existing fitness performance measures for all three time points analyzed and use statistical analyses to determine whether fitness and cell size still track each other.

CHLORPLAST IMPORT STRESS
Bianca Igwe
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 104
Mentor(s): Danny Schnell, Lynn Richardson

The chloroplast is an organelle in the plant cell that is the site of photosynthesis. The organelle imports about 3000 different proteins from the cytosol. TOC and TIC are membrane channels that allow the preproteins to enter the organelle from the cytosol. Our goal is to understand how the cell responds to the stress on the import system that interferes with the import process. We will study a mutant that expresses a truncated version of a core TOC component, to examine the cellular response to import stress. The mutant (*toc75-DP1*) shows varying degrees of paleness when grown on MS media. We hypothesize that the reason that there are degrees of paleness in the phenotypes is because of a stress response that compensates for the protein import defect in *toc75-DP1*. First, we extracted DNA from plants with a variety of paleness and then tested for the *toc75-DP1* mutant allele by PCR. Our results show that pale plants had the mutant allele present, while the greener plants did not have the mutant allele. This confirms our hypothesis, the reason why the plants are so pale is because they carry the mutant background. We also extracted protein and conducted a Western Blot to test for Toc75 protein levels. The results from the test was that the pale plants had more of Toc75-DP1 mutant protein compared to the green plants. Moving forward, these *toc75-DP1*mutants with different genetic backgrounds will be used for RNA-SEQ to understand the cellular response to import stress.

CONTROL OF RETINAL CHOLESTEROL LEVELS BY FASTING-INDUCED ACTIVATION OF SIRT1-LXR PATHWAY IN DIABETIC RETINOPATHY
Delaney Mcfarland
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 105
Mentor(s): Julia Busik, Sandra Hammer

Introduction: Diabetic retinopathy (DR) is a growing health concern with limited treatment options and is the leading cause of blindness in working age adults. Previous research has demonstrated dyslipidemia and cholesterol level dysregulation play significant roles in DR development, however strategies to normalize cholesterol regulation in the retina are limited. Major regulators of cholesterol metabolism are Liver X-receptors-α/β (LXR). LXR signaling has been shown to activate the reverse cholesterol transport (RCT). SIRT1 is a nutrient-sensing deacetylase activated during fasting, and a major regulator of LXR activity. Both SIRT1 and LXR levels have been shown to be decreased in diabetic retina. Hypothesis: Fasting-induced increase in SIRT1 followed by LXR deacetylation and activation, leads to the increase in RCT thus lowering cellular cholesterol levels. Method: To model fasting, bovine retinal-endothelial-cells (BRECs) were serum starved for 24 hours. Cholesterol concentration was determined via cholesterol assay, SIRT1 and LXR levels were determined by RT-PCR. Results: Serum starvation increased SIRT1 (1.01±0.14 to 3.01±0.27, n=3; p=0.001), as well as LXR-controlled genes ABCA1 (1.01±0.24 to 27.21±0.14; n=3; p<0.01), and ABCG1 (1.01±0.01 to

130.42±18.41, n=3; p<0.01), and there was a trend for cholesterol concentrations decrease from 0.033±0.002 M to 0.031±0.001 M, n=3. **Conclusion:** Fasting increases SIRT1 levels, further increasing LXR levels, and ultimately lowering cholesterol concentration via activation of RCT in BRECs. Activation of SIRT1-LXR pathway by fasting could be considered as a strategy for cholesterol regulation in diabetic retina. Research supported by R01EY025383 award to JVB.

ASSEMBLY AND ANNOTATION OF AN UNIDENTIFIED SPECIES OF AMANITA MUSHROOM

Patrick Rynkiewicz
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 106
Mentor(s): Kevin Childs

Amanita is a large genus of mushrooms found throughout the world. While some are edible, others are among the most poisonous mushrooms because they produce liver destroying peptides called amatoxins. Among them is α-amanitin, which inhibits RNA polymerase II resulting in cell death. Our lab collected an unidentified species of Amanita mushroom that produces α-amanitin. Preliminary analysis of the sequence composing the Internal Transcribed Spacer (ITS) region, commonly used for phylogenetic analyses, showed a 95% match to Amanita molliuscula but does not provide a confident identification. This project aims to assemble the genome of the unidentified Amanita mushroom using high-throughput Illumina short read and Oxford Nanopore long read sequencing methods. We will use the MAKER pipeline for gene annotation of the genome, identifying regions encoding genomic features such as introns, exons, and intergenic regions. It is estimated that up to eight percent of some fungal genes are polycistronic, i.e. loci in which two or more proteins are coded from one RNA transcript. Most gene prediction algorithms, which are used in genome annotation, are not designed to identify polycistronic genes. Therefore, a component of this project is the improvement of polycistronic gene detection in genome annotation. Additionally, we will identify novel genes related to the gene for amanitin (known as the cycloamanide gene family) through manually curated analysis of the assembled genome and supporting transcriptomic evidence. The final product of this work will be an assembled and annotated Amanita genome.

THE EFFECTS OF ENVIRONMENTAL CUES ON OBESITY

Kailinn Hairston
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 107
Mentor(s): Alexander Johnson

Advancements in technology and agriculture have contributed to the widespread growth of obesity globally. Current studies focus on brain signals involved in the decision making process of palatable food and drink consumption. Previous research from our laboratory has shown that environmental cues with food can drive overeating in animals. Our research explores the effects of environmental cues on brain systems that underlie this overeating behavior. Using a Cue Potentiated Feeding (CPF) model, in which a Pavlovian auditory conditioned stimulus (CS+) is paired with a food reward (sucrose), we examined activation of two sets of neuropeptides (Melanin Concentrating Hormone; MCH, and Orexin; ORX from obese and control mice. Both neuropeptides are involved in energy homeostasis and feeding behavior. Our experiment involved 12 weeks of ad libitum access to a High Fat Diet (HFD) or of standard lab chow. Following diet access, animals were removed from ad libitum diet access and instead fed once daily during training. During training, animals received 16 sessions of Pavlovian conditioning with 10 presentations of CS- (unpaired) and CS+ (paired with sucrose). After conditioning, animals were given 2-3 days of ad libitum access to their assigned diet to facilitate their return to base weight and ensure testing occurred under conditions of satiety. At test, the animals were split into CS- and CS+ groups; sucrose was available to the animals at all times, and overeating responses were measured. The activity of both MCH and ORX in the lateral hypothalamus region of the brain during CPF was quantified via dual fluorescence immunohistochemistry for MCH/Fos and ORX/Fos. From these experiments we hope to see increased neural activity during the time of the experiment when the environmental cue is present.

INFLUENZA AFFECTS ON GENE EXPRESSION AMONGST AGES
Kenneth Matthews
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 108
Mentor(s): George Mias

Influenza is a seasonal respiratory illness caused by the influenza virus, commonly known as the flu. Influenza is the eighth leading cause of death in United States of America, affecting approximately three million people annually. Those primarily affected are children five years of age and younger, who face a higher risk of being hospitalized due to influenza virus infection complications, and adults over the age sixty-five, who also face a higher risk of death from the influenza virus. The purpose of this study is to evaluate the immune responses to influenza via gene expression evaluation across different ages. We plan to investigate correlations between gene expression and age across different age group. We will analyze gene expression by analyzing publicly available microarray datasets, generated from blood samples of people with and without the influenza. We will be using R to analyze gene expression array data, and to assess statistical differences in age groups. We expect that children five and younger and adults sixty-five and older will have different immune gene expressions. Which could be the key determinant as to why they are more susceptible to the influenza virus every year.

IDENTIFYING LOCI RESPONSIBLE FOR RUST RESISTANCE IN SWITCHGRASS
James Cramton
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 109
Mentor(s): David Lowry

Plant pathogenic rust fungi (order Pucciales) are a major contributor to agricultural losses worldwide, affecting many different crops from legumes to cereal grains and switchgrass. Rust is capable of decreasing biofuel yields by greater than 50% in the bioenergy crop switchgrass. To develop effective management strategies for rust, it is important to first understand the genetic basis for resistance to the pathogen in switchgrass. An important step in gaining this understanding is developing quantitative phenotypes based on the severity of rust infection. This can be a difficult endeavor due to the subjective and often erroneous nature of using human raters to estimate disease severity. In this study, I developed a protocol for determining quantitative phenotypes based on the severity of rust on scanned images of switchgrass leaves. To determine the rust severity scores, I used color thresholding to quantify the percentage of leaf area occupied by rust fungus. I am using these phenotypes to identify quantitative trait loci (QTL) for rust resistance. I will compare the QTLs identified through my leaf-scan phenotypes with previously-identified QTLs mapped for subjective phenotypes determined by human raters on a categorical (1-10) scale. The results of this comparison should determine the relative utility of different phenotyping methods for the purposes of mapping pathogen resistance QTLs.

EFFECTS OF SUPEROVULATION ON 3D STRUCTURE OF THE ENDOMETRIUM
Hannah Lufkin
Category & Time: Cell Biology, Genetics & Genomics, Section 3, 1:00 - 2:15 PM
Poster: 110
Mentor(s): Diana Flores Diaz, Ripla Arora

Uterine crypt formation and folding are important for embryo implantation. Ovarian hormones, estrogen and progesterone, prepare the uterine lining for a healthy pregnancy and possibly affect uterine structure. Clinically, artificial reproductive technologies are employed to help women get pregnant. Most of these technologies, including in-vitro fertilization (IVF), mimic pituitary hormones that act on the ovary to increase the number of eggs released, increasing the chance of fertilization. Research indicates that superovulation prior to IVF affects the quality of the uterine lining influencing the ability of the embryo to attach and thrive in the uterus. To simulate the effects of IVF in women, two groups of female mice were mated: (i) a control group and (ii) a group of super ovulated females. The mice were super ovulated by injecting 5IU of pregnant mare serum gonadotrophin and 48 hours later injecting 5IUof human chorionic gonadotropin. On Day 3 of pregnancy, uteri were dissected and fixed followed by immunofluorescence for epithelial markers. Confocal microscopy was used to image the uterine samples and the 3D structure of the uteri was visualized and evaluated for the quality of the uterine lining. Preliminary results indicate that superovulation causes aberrant folding of the uterus. We are currently investigating the hypothesis that increased levels of ovarian hormones leads to this aberrant folding, thus affecting embryo survival. Our research will guide timing of embryo transfer in the clinic, possibly favoring embryo transfer at later times as opposed to the cycle of hyperstimulation for IVF.

ROLE OF ARABIDOPSIS THALIANA GENES IN SEED OIL BYOSYNTHESIS
Diego Mendoza
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 113
Mentor(s): Christoph Benning, Patrick Horn

Plant lipids (or oils) are essential for plant growth and development. They serve important functions such as, but not limited to, synthesis of the cellular and organellar membranes as well as storing energy reserves. Furthermore, these energy reserves are important for human and animal nutrition, and they provide a wide variety of industrial and commercial products (e.g. biofuels, soaps, detergents etc.). We are testing multiple gene candidates in Arabidopsis thaliana for their role in seed oil accumulation, and whether their absence affects the formation of lipid droplets (LDs), the organelles that store seed oils. The gene candidates were identified through a combination of coexpression analysis of plant LD-associated proteins and homologs of LD associated proteins identified in other non-plant organisms. We are phenotyping their respective T-DNA insertion transgenic lines by monitoring plant growth and development, observing LD morphology and abundance by microscopy, and quantifying levels of seed and leaf lipid amounts and composition. Promising gene candidates will be further characterized for their modes of action and utilized to further engineer plant oils in Arabidopsis and other energy-rich organisms such as crops and algae.

THE EFFECT OF TRANSPOSON TYPES ON NEIGHBORING GENE EXPRESSION
Scott Teresi
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 114
Mentor(s): Patrick Edger

Transposable elements, genomic features that replicate within a host genome, are ubiquitous across all eukaryotes; for example, an estimated 80% of the maize genome belongs to transposable elements (TEs). The methylation of transposable elements, a mechanism that silences them, has been shown to negatively impact the expression of nearby genes (i.e. collateral damage). However, the impact of specific TE classes and families, as well as their methylation status, on adjacent gene expression remains poorly understood. Do all TE classes and families similarly impact gene expression? Here we characterize the relationship between gene expression and transposon presence as a function of density in sliding windows and proximity to the gene of interest. We report our findings using both *Arabidopsis thaliana* (thale cress) and *Fragaria x ananassa* (strawberry) as model systems. These findings have far reaching implications in agricultural, ecological, and evolutionary research. For example, introgression and hybridization are commonplace in breeding programs, knowing if a target gene will become silenced, or become more dominantly expressed, will guide the selection of superior crosses.

GENOTYPING AND IMMUNOPHENOTYPING FOR IDENTIFICATION OF VARIOUS MICE STRAINS
Kanedra Thaxton
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 115
Mentor(s): Rupali Das, Elahe Crockett-Torabi

Introduction: Various genes related to cancer and allergies were studied in mice to determine the importance, in each disease. To ensure that the mice are knockouts for the genes, they were checked through genotyping and immunophenotyping processes. PML- RARA- regulated adapter molecule (PRAM) and Adhesion- and Degranulation Promoter Adapter Protein (ADAP) are genes that were checked through genotyping using Polymerase Chain Reaction (PCR). Flow Cytometry Staining (FACS) was used for immunophenotyping, to check for the Cluster of Differentiation 2 (CD2) gene. Methods: PRAM knockout, ADAP knockout, and ADAP- PRAM double knockout (APDKO) mice tail clippings were treated with Tail Lysis Buffer at 37 °C overnight. Through a serious of steps, PCR was performed on the samples to isolate the DNA. The results were compared to the positive PRAM knockout control. When using FACS, immune cells were isolated from the mouse and identified using antibodies that recognizes markers on the surface of the cell and sorts the samples. Results: Each of the PRAM samples and APDKO samples tested, matched the positive control showing that the gene was not present, the ADAP samples showed negative results. The FACS results showed that some of the mice were positive for CD2, while others were negative. Conclusion: Immunophenotyping and genotyping are the techniques used to confirm the presence or absence of the desired genes, which can lead to loss or gain of a function related to cancer or allergy diseases. Support: K.T. a REPID scholar, supported by NIH-5-R25-HL108864 award to E.C.

PREDICTIONS OF SPECIALIZED METABOLISM GENES IN SOLANUM LYCOPERSICUM
Aaron Lee
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 116
Mentor(s): Shinhan Shiu

Plant specialized metabolism (SM) encompasses thousands of compounds which play important roles both in ecological interactions and in human adaptation of the natural world, especially in medical and agronomic settings. The number of specialized metabolites greatly exceeds the number of general metabolites; In contrast to general metabolism (GM) pathways, many biosynthetic pathways for specialized metabolism are not very well understood. With the goal of establishing a novel system for gene prediction, a machine learning-based predictive framework has shown that identification of distinguishing characteristics of SM pathways can be used to predict SM genes in *Arabidopsis thaliana*. We apply a similar workflow using commercially significant *Solanum lycopersicum* (tomato) as a model system, investigating evolutionary features of SM pathways related to orthologous genes and gene duplication. We identified orthologs to tomato genes in 25 species and found significant depletion of orthologs in SM pathways compared to GM pathways in 20 of the 25. We also found a tendency for genes in SM pathways to have originated from more recent duplication events than genes in GM pathways. These data suggest that SM genes are less conserved across lineages, but it is important to note that there was high variability between pathways. These features will be integrated in a machine learning model, which will test the predictive ability of evolutionary characteristics in selected SM pathways.

EFFECT OF SERUM STARVATION ON THE SIRT1-LXR SIGNALING PATHWAY AND INFLAMMATION IN IN VITRO DIABETIC RETINOPATHY MODEL
Maximilian Sandler
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 117
Mentor(s): Elahe Crockett-Torabi, Julia Busik, Sandra Hammer

Introduction: Diabetic Retinopathy (DR) is a complication that causes progressive damage to the retina and is the leading cause of vision loss in adults. While there have been studies investigating DR, treatment options remain limited. Chronic inflammation is accepted as a leading cause of DR pathogenesis, however the factors leading to inflammatory changes in diabetic retina are not fully understood. Liver X Receptors α/β (LXR) are well accepted anti-inflammatory regulators. It has been shown the LXR can be activated through deacetylation by nutrient-sensing deacetylase SIRT1. Both SIRT1 and LXR levels are decreased in diabetic retina. Hypothesis: Retinal Cells that undergo serum starvation will have higher expression of SIRT1 promoting activation of the SIRT1-LXR signaling pathway. This will downregulate inflammatory genes such as IL-1β, ICAM1, VCAM1, and MCP1 reducing DR complications. Methods: Bovine Retinal Endothelial cells (BRECs) were plated in 10% Fetal Bovine Serum (FBS) BREC Media. After cells reached 80% confluency, cells under control and diabetogenic (TNFα) conditions were transferred to 10%, 5%, 2%, 1%, and 0.1% FBS media. After 24 hours, cells were collected and analyzed through RT-PCR. Results: Serum starvation increased SIRT1 (1.01±0.14 to 3.01±0.27, n=3; p=0.001). Increase in SIRT1 leads to LXR activation. LXR activation decreased TNFα-induced IL-1β production. Conclusion: Serum starvation increases SIRT1-LXR pathway expression and decreases inflammatory gene expression in BRECs. Amplified SIRT1 expression is hypothesized to reduce DR pathogenesis brought on by inflammatory changes. Support: MS a REPID scholar, supported by NIH-5-R25-HL108864 award to EC; research supported by R01EY025383 award to JVB.

THE EFFECTS OF ASTROCYTE ACTIVATION ON EXTRACELLULAR TSPO PROTEIN LEVELS
Sera Sermet
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 118
Mentor(s): Robert Crawford, Norbert Kaminski

Translocator protein (TSPO) is primarily found on the outside of the mitochondrial membrane and is involved in cholesterol binding, steroid synthesis and bile acid synthesis. In recent years, there have been animal and human studies showing that concommitant with neuroinflammation, there are increased levels of TSPO on certain cell types, most notably microglial cells. More recently, the Kaminski lab has identified TSPO expression on the surface of immune competent cells. Here, we hypothesize that TSPO protein expression is induced on the surface of astrocytes when they are activated through toll-like receptor (TLR) binding. To test this hypothesis, the human actrocyte line, U-251, was activated using various TLR receptor agonists. After a 24 hour treatment period, the astrocytes were stained for TSPO and analyzed by flow cytometry to determine the levels of TSPO on the surface of astrocytes. We also plan to conduct the same study using primary astrocytes to determine whether U-251 cells respond similarly to primary astrocytes. Using

this study, we aim to increase the knowledge concerning the role of TSPO in neuroinflammatory responses. Ultimately, this knowledge might be used to better understand whether TSPO could be used as a biomarker of neuroinflammation.

INHIBITION OF PPAR-GAMMA ACTIVATION REDUCES MACROPHAGE NUMBERS IN THE LIVER AFTER ACETAMINOPHEN OVERDOSE
Makayla Robinson
Category & Time: Cell Biology, Genetics & Genomics, Section 4, 1:00 - 2:15 PM
Poster: 119
Mentor(s): Bryan Copple

Introduction: Acetaminophen is a commonly used over the counter medication that produces liver damage when taken in excess. In fact, acetaminophen overdose is the number one cause of acute liver failure in the US. Identification of ways to stimulate liver regeneration in overdose patients could greatly reduce the incidence of liver failure. Accordingly, in the present study, the role of PPAR-Gamma (PPARγ) in liver repair after acetaminophen overdose was determined. Methods/Results: Mice were treated with either 300 mg/kg of acetaminophen or saline (control). To determine the role of PPAR-γ, mice received intraperitoneal injections of either vehicle (dimethyl sulfide) or PPAR-γ antagonist (T0070907) 24 and 48 hours following acetaminophen injection. Liver and serum samples were collected at 72 hrs. Serum levels of alanine aminotransferase, a marker of liver injury, were not different between mice treated with vehicle or PPAR-γ antagonist. Immunohistochemistry revealed that the PPAR-γ antagonist reduced the number of liver macrophages at 72 hours after acetaminophen treatment. Consistent with this, real-time PCR showed reduced levels of the chemokine receptor, Ccr2. The antagonist did not reduce levels of the chemokine, Ccl2, however, which recruits macrophages to the liver in a Ccr2- dependent manner. Conclusion: These findings indicate that PPAR-g is an important regulator of macrophage numbers in the liver after acetaminophen overdose. Since macrophages are critical for liver regeneration after acetaminophen overdose, modulation of PPAR-γ may help to stimulate liver regeneration in acetaminophen overdose patients. Support: M.R. REPID Scholar, supported by NIH-5- 525-HL108864 to Elahê Crockett.

UNDERSTANDING THE MISREGULATION OF THE COP9 SIGNALOSOME IN EPITHELIUM DERIVED CANCERS
Selena Cholak, Eoin Barry, Victoria Krajcz
Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 122

The epidermis, the outermost layer of skin, serves as a critical barrier against the outside environment. A common feature among cancerous epidermal cells is a desmosomal mutation that results in the loss of cell-to-cell adhesion, which is required for the proper formation of tissues. Desmosomes have been shown to interact with the COP9 Signalosome. This complex serves to inhibit function of epidermal growth factor receptor (EGFR), a signaling pathway known to mediate cell growth and epidermal differentiation. EGFR is stabilized by Nedd8, a ubiquitin-like protein. Upon the removal of Nedd8, EGFR is destabilized, allowing for a dampening of its growth signaling transduction pathway. The removal of Nedd8 occurs through a super-complex of the desmosome and the COP9 Signalosome, an eight-subunit multi-protein complex previously known to cleave Nedd8 from cullin-ubiquitin ligases. While the desmosome-COP9 Signalosome super-complex functions have been well defined for the maintenance of skin homeostasis, its potential role in epithelial-derived cancers has not yet been explored. Since EGFR overexpression is known to exist in a variety of cancers, we question the extent to which the desmosome-COP9 Signalosome could be contributing to this overexpression in cancer. Through protein analysis in a variety of cancer cells lines, this research aims to clarify the process by which the desmosome-COP9 Signalosome complex contributes to a cancerous phenotype.

ANGIOTENSIN-1-7 STIMULATES IN VITRO INTESTINAL EPITHELIAL CELL MIGRATION
Rakhi Shah
Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 123
Mentor(s): Elahe Crockett-Torabi, Lizbeth Lockwood, Mark Kadrofske

Background: Cell migration is important for intestinal wound healing and repair. In the renin angiotensin system (RAS) pathway, angiotensin 1-7 (Ang/1-7) is produced from angiotensin II via the angiotensin converting enzyme II. Because Ang/1-7 has been found to increase the migration of renal cell carcinoma cells, we hypothesize that Ang/1-7 may stimulate intestinal enterocyte migration. Our goal was to determine the effects of Ang/1-7 on enterocyte migration in vitro, and to evaluate if Ang/1-7 is produced endogenously by enterocytes. Methods: Caco-2 (human colorectal adenocarcinoma) cell migration was measured using a modified in vitro wound healing assay. Three sets of trials were

performed to observe the migration of Caco-2 cells in the presence of varying concentrations of Ang/1-7 (100nM-10pM) over 24-hours after serum starvation. The area created by the migration of the cells over the 24-hour treatment period was measured. Results: The migration area of Caco-2 cells increased as the concentration of Ang/1-7 increased from 1nM to 100nM compared to non-Ang/1-7 treated cells. There was no effect on the migration area when the Caco-2 cells were treated with 10pM and 100pM Ang/1-7 compared to the control groups. We are presently measuring the endogenous production of Ang/1-7 in Caco-2 cells under various experimental conditions. Conclusion: Our results suggest Ang/1-7 could regulate intestinal wound healing and might eventually provide a therapeutic target. Support: R.S. is a REPID Scholar, supported by NIH-5-R25-HL10886407 award to Elahé Crockett, REPID-Program Director.

IDENTIFYING CRITICAL TRANSITION STATES OF PANCREATIC CELLS WITH NON-LINEAR DYNAMICS
Bianca Davila Montero
Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 124
Mentor(s): Sudin Bhattacharya

According to the American Diabetes Association (ADA), 30.3 million Americans had diabetes in 2015, and 1.5 million are diagnosed each year. Diabetes is a disease where the pancreas is not able to process sugars, thereby directly affecting the sugar content in the bloodstream. At a cellular level, diabetes is caused by a combination of increasing insulin (INS) resistance in peripheral tissues and reduced mass or dysfunction of pancreatic cells, a type of endocrine cell in charge of producing hormones with different functions. The dysfunction of pancreatic cells can be analyzed using single-cell RNA sequencing (sc-RNA-Seq). Segerstolpe et al. (2016) carried out sc-RNA-Seq of the pancreatic transcriptomes of six healthy and four Type 2 Diabetes donors. Based on this published study, we aim to identify the relative percentages of various pancreatic cells, and reconstruct a pseudo-time trajectory where each cell with its specific gene expression represents a different stage of development or disease progression. For visualization of single cell data and trajectory reconstruction, we will use the published Seurat and Monocle algorithms. Both of these algorithms are open source and available as R packages. Once Monocle establishes a path for the cell fate differentiation, further analysis needs to be done to define the critical transition states. Can the onset of cell differentiation, whether a cell becomes a functional cell or not, be identified? Mathematical models based on non-linear dynamics will be applied to predict transitions along the cellular trajectory based on autocorrelations with respect to time.

EFFECTS OF VGAT KNOCKDOWN ON RECORDING QUALITY AND TISSUE RESPONSE IN THE BRAIN
Samuel Daniels
Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 125
Mentor(s): Erin Purcell

Neural interface technologies are increasingly used to understand normal brain function and neurological diseases. However, recording quality and signal detection is significantly lost in a chronic setting. In a recent study, profound increases in excitatory vesicular glutamate transporters (VGLUT) were found within days of the original implant. Subsequently, a progressive shift towards an inhibitory state was observed with an increase in vesicular GABA transporters (VGAT) in parallel with decreasing VGLUT levels. Here, we are currently exploring stealth siRNA to knockdown VGAT in vitro in cultured primary rat cortical neurons. Results will be obtained using immunohistochemistry and qPCR to evaluate the efficacy of VGAT knockdown. In addition, patch clamp electrophysiology will be performed one-week post transfection to determine the firing characteristics of knocked down neurons. Based on the in vitro results, knock down of VGAT in vivo will be investigated to analyze the change in recording quality and signal detection. Methodology for in vivo delivery will be established as well. We are studying the influence different levels of VGAT will have on recording quality and mediating inflammation surrounding an implanted microelectrode.

THE ROLE OF NRF2 IN THE REGULATION OF IL-17A PRODUCTION BY PRIMARY MURINE CD4 T CELLS

Maria Poidomani

Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 126
Mentor(s): Cheryl Rockwell, Elahe Crockett-Torabi

Introduction: Nuclear factor erythroid 2 related factor 2 (Nrf2) is a stress-activated transcription factor that induces antioxidant and detoxification genes to ameliorate oxidative stress. Nrf2 is implicated in immune system regulation, of which helper (CD4) T-cells are a central component. Upon immunogenic stimuli CD4 T-cells tailor an immune response to a pathogen through differentiation into one of several effector subsets. The food preservative and known Nrf2 activator tert-butylhydroquinone (tBHQ) skews CD4 T-cell differentiation towards the Th2 subset in a Nrf2-dependent manner, however, the role of Nrf2 in differentiation of other effector subsets remains undetermined. This project's goal is to understand the role of Nrf2 in Th17 differentiation, characterized by IL-17a production. Hypothesis: We hypothesize that activation of Nrf2 by tBHQ will inhibit Th17 differentiation. Methods: CD4+ T-cells isolated from wild type (WT) or Nrf2-null mice (C57B6/J background) were treated with up to 1μM tBHQ or vehicle control for 30-minutes, followed by T-cell specific activation. 96-hours post-activation, IL17a production was quantified by ELISA. Results: Nrf2-null CD4 T-cells produced significantly more IL17a than WT-cells, and tBHQ treatment suppressed IL17a protein production in a dose-dependent manner. Conclusion: These data suggest a role for Nrf2 in the regulation of Th17 cytokine responses, a key component of the immune response to extracellular pathogens. Suppression of this response by Nrf2 activators could potentially compromise the ability to fight infection by such pathogens. Support: M.P. REPID scholar, supported by NIH-5-R25-HL108864 award to E.C., and R01 ES024966 (to C.E.R.).

CD2 CONTRIBUTES TO THE CORTICOSTEROID RESISTANCE (CR) PHENOTYPE OF INKT CELLS IN ASTHMA

Manthan Patel

Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 127

Asthma is a chronic disorder, mostly managed by corticosteroids (CS), b2 agonists and anti-leukotrienes, but as many as 10-30% of patients do not respond to this therapy and account for about 50% of the healthcare costs of asthma. Given the essential role of invariant natural killer T cells (iNKTs) in the pathogenesis of asthma, coupled with their resistance to CS treatment, further understanding of the immunological basis for iNKT cell-mediated asthma progression is highly warranted. Our recent studies demonstrate that the immunoreceptor, CD2 is highly expressed on human iNKTs (hu-iNKTs) and lungs of asthma patients. In the presence of glycolipid antigen (aGC), hu-iNKTs produce cytokines, which is significantly reduced in the presence of anti-CD2 blocking mAb but not in the presence of dexamethasone (DEX, a CS). However, when these cells are stimulated by aGC in the presence of DEX and anti-CD2 mAb, cytokine production is greatly reduced, suggesting that CD2 contributes to the CR phenotype of hu-iNKTs. Collectively, our studies demonstrate that CD2 may serve as an attractive therapeutic target for the treatment of asthma patients that are recalcitrant to conventional therapies.

NOVEL APPLICATIONS AND EXTENSIONS OF SEQUENTIAL RESAMPLING RANDOM WALKS FOR STATISTICAL SUPPORT ESTIMATION

Rei Doko

Category & Time: Cell Biology, Genetics & Genomics, Section 5, 1:00 - 2:15 PM
Poster: 128
Mentor(s): Kevin Liu

Support estimates are used to measure the reliability or error of an inference. Resampling techniques are a common method for performing support estimates. The sequential resampling (SERES) method is a way of performing support estimates that has been shown to yield more accurate results than existing resampling methods for both aligned and unaligned sequences. One topic of interest is the performance of a parallel implementation of SERES. Running multiple replicates of SERES walks on a sequence in parallel benefits in speed, but also with the information of multiple replicates at once can affect the outcome of the method. Development of a non-parametric SERES technique for aligning sequences for comparison is also a problem of interest.

THE EFFECTS OF FLAGELLA GROWTH ON GENERATION TIME IN SALMONELLA ENTERICA
Timothy Brantley
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 131
Mentor(s): Yann Dufour

The purpose of this study is to examine how an increasing number of flagella on the bacteria *Salmonella enterica*, will influence the rate of their generation times. A wild-type strain will be used to compare against the experimental inducible strain of *S. enterica*. Predictions are that the wild-type strain will out-compete the inducible strain when a large amount of inducer is added. The inducer will cause more than the average 1-3 flagella to be produced on the cells of the inducible strain, at the expense of resources that would usually be allocated for cellular division. Additionally, when no inducer is added or at smaller concentrations of inducer, it is thought that the inducible strain will then out-compete the wild-type strain. Predictions for growth are under the conditions that there is no direct advantage for the bacteria gaining an increased ability to swim. To test the generation speeds of two different strains of bacteria, the wild type and inducible strains of *S. enterica* will be grown in competition to each other. To visualize which strain has out competed the other, the wild type strain has been marked to fluoresce yellow and the induced stain has been marked to fluoresce blue. A fluorescent plate reader will then be used to view which strain's color appears in higher quantity.

REDUCTION OF IL-8 RESPONSE TO HYPEROXIC AND NORMOXIC CONDITIONS BY THE MAS AGONIST AVE-0991
Malcolm Davis, Michael Mark
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 132
Mentor(s): Bruce Uhal

Background: Fibrotic pulmonary diseases such as bronchopulmonary dysplasia (BPD) have been found to develop in premature neonates that are exposed to hyperoxic gas. Our previous research has found that AVE 0991, a non-peptide Mas agonist, can be used to inhibit hyperoxia induced apoptosis and loss of epithelial barrier function. Like apoptosis, inflammation is a pivotal characteristic in the development of BPD. Interleukin-8 is a chemoattractant cytokine that has been found to increase during inflammatory responses, classifying it as a proinflammatory mediator. Hypothesis: It is hypothesized that hyperoxic cell exposure will activate IL-8 triggering an inflammatory response. Treating the hyperoxic cells with AVE 0991 will significantly decrease the percentage of activated IL-8 cytokines. Methods: To test this hypothesis, 8 plates of A549 lung epithelial cells were placed in separate incubators. 4 plates were incubated in 95% Oxygen and the other group in 22% oxygen. Each set of plates was incubated for a different duration of time. The cells were then harvested and an IL-8 ELISA assay was conducted. Results: Data for this experiment is currently being generated and will be presented at Mid-SURE. Conclusion: If the data generated by this experiment supports the stated hypothesis, a deeper understanding of the relationship between the effect of hyperoxic exposure to the lungs, and the renin angiotensin system can be obtained leading to further insights associated with the treatment of BPD. Support: M.D's research was supported by the Dow Stem Scholars DSSP Scholarship.

EXAMINING THE EVOLUTION AND GENETIC CONTROL OF CAM PHOTOSYNTHESIS IN SEDUM
Serena Lotreck
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 133
Mentor(s): Robert VanBuren

Water use efficiency (WUE) of agricultural crops is becoming of increasing significance as the world grows hotter and drier. In order to meet our increasing global food demands, we need to produce more food on less land and with less water. Many crops are C3 plants, which lose large amounts of water through stomatal evapotranspiration during the day. In Crassulacean Acid Metabolism (CAM) photosynthesis, carbon fixation occurs nocturnally in order to minimize water loss, giving CAM plants more than double the WUE of C3 plants. The genetic basis of CAM is largely unknown, but may be useful for engineering improved WUE in crop plants. In this project, two species of Sedum, S. makinoi and S. mexicanum, are examined to unearth the genetic mechanisms controlling CAM. Using physiological data including stomatal aperture and titratable acidity, the type of CAM each species performs will be determined. RNAseq will be used to identify potential genes of interest that may control the regulation of CAM. The results of this research will provide further information with which to elucidate the evolutionary origins of CAM, as well as its genetic regulators.

HYPEROXIC GAS EFFECTS ON CYTOKINES IL8 AND IL10 IN ALVEOLAR EPITHELIAL CELLS
Michael Mark
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 134
Mentor(s): Bruce Uhal

BACKGROUND: Bronchopulmonary dysplasia is a chronic lung disease that affects mostly premature newborns and infants. The disease results from apoptosis of cells in the lungs which leads to inflammation of lung tissue caused by excess oxygen associated with prolonged use of mechanical ventilation or a respirator. Our lab uses an hyperoxic gas chamber to replicate the use of a respirator. Prior lab experiments have shown that AVE-0991, a nonpeptide Mas agonist of angiotensin (1-7), inhibits apoptosis and has anti-inflammatory effects in cells treated with hyperoxic gas. To further understand the mechanisms behind these findings, our lab will test the levels of cytokines IL8 and IL10 in A549 cells after being treated with AVE-0991 and hyperoxic gas. Since IL8 and IL10 are cytokines associated with inflammation, we hypothesized that AVE0991 will reverse the effects of hyperoxic gas on IL-8 or IL-10 release by the cells. METHODS: IL8 and IL10 levels will be tested in cells with AVE-0991 and also cells treated with hyperoxic and neumoxic gas after four different timepoints. A549 cells will be subcultured into different cell plates. When at the right confluency they will be treated with AVE-0991 and put in hyperoxic and neumoxic gas. ELISA kits will then be used to test their IL8 and IL10 levels. RESULTS: We predict that cells treated with AVE-0991 will have higher levels of IL10, since it's an anti-inflammatory cytokine, but lower levels of IL8 because it's pro-inflammatory. We also expect the cells treated with hyperoxic gas to have a higher levels of IL8 and lower levels of IL10. CONCLUSIONS: Understanding the relationship between IL8 and IL10 with AVE-0991 and hyperoxic gas will help us to better understand the mechanisms behind apoptosis and inflammation associated with excess oxygen and may lead to new ways to treat and prevent this disease.

DEFINING THE ROLE OF LHA NEUROTENSIN NEURONS IN DRINKING BEHAVIOR
Kymberli Maddox
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 135
Mentor(s): Gina Leinninger, Elahe Crockett-Torabi

Introduction: While eating and drinking are vital operations for survival, it is still unclear how the brain motivates the body to carry out these functions. Moreover, when these behaviors become maladaptive they may lead to insufficient or excessive intake that causes disease, such as anorexia, obesity, dehydration or polydipsia. Motivation: Therefore, it is imperative that neural circuits controlling food and water intake be defined, so that safe and effective pharmacological treatments can be developed to treat abnormal ingestion and improve health. The Leinninger lab has identified a group of neurons in the lateral hypothalamic area (LHA) that express the neuropeptide neurotensin (Nts), and when activated they promote water intake. Hypothesis: LHA Nts neurons direct physiologic drinking behavior by modifying the motivation to obtain water. Methods: To investigate the hypothesis, Designer Receptors Activated by Designer Drugs (DREADD) were used to permit "on command" activation or inhibition of LHA Nts neurons in mice. These mice were trained via operant conditioning to "work" to obtain water, and their performance reflects how motivated they are to drink. Determining if DREADD-activating or inhibiting LHA Nts neurons modifies the willingness to work for water will reveal if these neurons modulate the motivation to drink. Conclusion: Together these data will determine whether LHA Nts neurons encourage drinking by increasing motivation to work for water and whether activation of these neurons are required to maintain drinking behavior. K.M. is a REPID scholar, supported by NIH-5?R25-HL108864 award to Elahé Crocket.

PREDICTING TRANS-REGULATORY NETWORKS ON GENE EXPRESSION FOR IMPROVED DISCOVERY OF DISEASE-ASSOCIATED GENETIC VARIANTS
Nathan Olson
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 136
Mentor(s): Jianrong Wang

Identification of disease-associated genetic variants and the underlying mechanisms is one of the most significant problems in biomedical research. Traditional genetic approaches are limited by their statistical power for large-scale discoveries in diverse tissues, especially for non-coding genomic regions which comprise 90% of the genome. The major hypothesis is that non-coding genetic variants induce disease through dysregulation of gene expression. Therefore, an accurate and comprehensive prediction of regulatory networks play pivotal roles to decode the genetic basis of diseases. Most recent research have focused on cis-regulatory networks where the regulatory elements are close to target genes. In our study, we significantly expand the network construction by including predictions of trans-regulation,

where the regulatory elements and transcription factors are located far away from the target genes in the 1D genome. Based on multi-omics datasets, a unique feature of our algorithm is to leverage the long-range regulatory links in 3D chromatin structure and explore the complex regulatory relationships. Our Random Forest model is expected to provide a three-layer network for transcription factors, distal enhancers and target genes. The network predictions will be further integrated with genetics data to discover novel trans-regulatory genetic variants associated with different phenotypes.

DETERMINING THE FUNCTION AND REGULATION GENES SELECTIVELY INDUCED BY ACIDIC PH IN THE PRESENCE OF GLYCEROL IN MYCOBACTERIUM TUBERCULOSIS

Chioma Ngene
Category & Time: Cell Biology, Genetics & Genomics, Section 6, 1:00 - 2:15 PM
Poster: 137
Mentor(s): Robert Abramovitch

Tuberculosis is an infectious bacterial disease that is caused by the bacterium *Mycobacterium tuberculosis* (Mtb). Mtb arrests its growth at pH 5.7 in the presence of glycerol as the sole carbon source but continues its growth in the presence of pyruvate. Genes *prpC* and *prpD*, which are known to be induced during times of propionate toxicity as part of the methylcitrate cycle, were upregulated by glycerol at an acidic pH, but not with pyruvate. Other genes, *Rv2557*, *Rv2558*, and *Rv2559c* displayed similar expression patterns as *prpCD*, but have no known function. We hypothesize that *Rv2557*, *Rv2558*, and *Rv2559c* are involved in propionate toxicity response in the presence of glycerol at pH 5.7. An alternative pathway, the methylmalonyl-CoA pathway can relieve *prpCD* when vitamin $B_{12}$is introduced. Thus, the expression of *Rv2557*, *Rv2558*, and *Rv2559c*will be determined using quantitative real time polymerase chain reaction (qRT-PCR) under the conditions of Glycerol at pH 7.0 and 5.7 in conjunction with or without Vitamin B_{12}. We hypothesize that these genes, *Rv2557, Rv2558,* and *Rv2559c* will not be induced in the presence of Vitamin B_{12}, suggesting their role in propionate toxicity. Understanding the role these genes play in the metabolic processes of *Mycobacterium tuberculosis* helps us better understand mechanisms of bacterial pathogenesis and discover new ways to treat the disease.

CHEMICAL ENGINEERING & MATERIALS SCIENCE

ADAPTIVE MESH REFINEMENT FOR THE SMOOTHED BOUNDARY METHOD

Kendell Crowley
Category & Time: Chemical Engineering & Materials Science, Section 1, 1:00 - 2:15 PM
Poster: 141
Mentor(s): Hui-Chia Yu

In this project, the smoothed boundary method (SBM) is applied to solve a partial differential equation (diffusion) with an adaptive mesh refinement (AMR) technique to increase the numerical accuracy of simulating the diffusion process in a battery electrode. Fick's second law of Diffusion is reformulated to a SBM diffusion equation with Neumann boundary conditions considered. A domain parameter is acquired through diffusion smoothing the microscopic images of an electrode, which is used to describe the 3D complex microstructure of the electrode. This image-based domain parameter is incorporated into the SBM to simulate the diffusion within the complex geometries. Adaptive mesh refinement with bottom up quad-tree analysis is utilized to refine the grid system in the interface regions of the microstructure. With this AMR technique, the diffusion process can be more accurately simulated.

MECHANISMS OF ENDOCYTOSIS OF SHORT INTERFERING RNA (SIRNA) THERAPEUTICS

Hannah Cavagnetto, Daniel Vocelle
Category & Time: Chemical Engineering & Materials Science, Section 1, 1:00 - 2:15 PM
Poster: 142
Mentor(s): Stephen Walton

RNA interference (RNAi) is a natural pathway in eukaryotic cells that, when activated, specifically targets and degrades messenger RNA strands, reducing expression of a particular protein. While cells use RNAi for natural regulation of protein expression, it can also be initiated by the addition of short interfering RNAs (siRNAs). siRNAs are double-stranded RNA molecules around 20 base pairs in length that initiate RNAi upon entry into the cytoplasm of a cell. Because of their specificity and ease of synthesis, siRNAs are being explored as potential therapeutics. However, there are barriers to their efficacy, including delivery into cells. siRNAs must be bound to a delivery vehicle to enter cells via endocytosis and avoid degradation from extracellular nucleases. Furthermore, siRNAs may enter cells through a variety

of endocytic pathways, which may be important to maximizing siRNA delivery and activity. Here, we wanted to explore how the mechanism of uptake by the cells influenced the quantity of siRNA taken up and the degree of reduction in the target protein. Uptake of siRNAs by multiple cell lines was studied in the presence of several endocytic inhibitors. Our preliminary results suggest that specific endocytic pathways are more productive in siRNA delivery for different cell lines.

CHARACTERIZING THE FATIGUE STRENGTH OF AL AND FE MODIFIED TI-13CR ALLOYS

Josue Canizales
Category & Time: Chemical Engineering & Materials Science, Section 1, 1:00 - 2:15 PM
Poster: 143
Mentor(s): Carl Boehlert

Beta titanium alloys are light, strong, biocompatible and high corrosion resistant alloys that have served as the leading material for applications in the aerospace and biomedical industry since the late twentieth century. However, their use is limited by their high production cost and lack of strength under fatigue settings. Even though there are numerous studies showing the high strength of omega phase titanium alloys, their direct structural and implant application has yet to be explored. Developing more affordable and overall stronger titanium alloys can attract consumers in applying these new materials. The goal of this study is to characterize the fatigue strength of omega phase titanium alloys and determine which alloy has the highest fatigue strength under thermal fatigue. Beta titanium alloy samples consisting of iron, chromium, and aluminum will be quenched after heat treatment at 400C for twelve hours, which hardens the alloy by causing the omega phase to transform from the beta phase. The omega phase titanium alloys will then be fatigue tested at 400C to record the cycles needed for fracture. This data will be compared to the fatigue strengths of currently used beta titanium alloys. From the four different samples, the alloy containing all four metals is expected to be the best option since aluminum is light and strong, chromium stimulates corrosion resistance and hardness, and iron contributes as a strong and ductile metal. While omega-phase titanium alloys offer greater strength, a drawback is their brittleness.

POLYURETHANE FLEXIBLE FOAMS DERIVED FROM RENEWABLE FEEDSTOCK

Ian Scheper
Category & Time: Chemical Engineering & Materials Science, Section 1, 1:00 - 2:15 PM
Poster: 144
Mentor(s): Ramani Narayan

Polyurethane foams (PUFs) are indispensable materials having a broad range of applications in automotive, construction, packaging, and insulation. PUFs are made from two major components: polyols and isocyanates. Polyols are polymers containing multiple hydroxyl (OH) groups, whereas isocyanates contain isocyanate groups (N-C=O). Most of the polyurethanes available commercially are produced from polyolswhich are derived from non-renewable petroleum feedstock. The primary objective of this work was to synthesize PUFs from polyols made from soybean oil. Biobased polyols derived from soybean oil are available in the market but most of them have secondary hydroxyl groups making them less reactive. In the current work, bio-based polyols containing primary hydroxyl groups, with low hydroxyl values, and higher renewable content were used for PUFs. PUFs are formed from two simultaneously occurring reactions: gelling reaction and blowing reaction. The former involves reaction of isocyanates with polyol, while the latter involves reaction of isocyanates with water. A good foam having uniform cell size and mechanical strength can be produced by balancing these two reactions. Various catalysts such as blowing agents, surfactants, and crosslinking agents, control the rates of these two reactions. The goal was to optimize the proportion of each of the catalysts in the final foam formulation. The final formulation will then be used to make a box foam which will be subsequently characterized for mechanical properties (tensile, tear and compression strength), as well as thermal properties. These properties will be compared with the control foam made using commercially available polyols.

THE EFFECT OF SMALL-STICKY NANOPARTICLES TO THE CRYSTALLIZATION KINETICS OF POLYMERS
Adam Francis
Category & Time: Chemical Engineering & Materials Science, Section 2, 1:00 - 2:15 PM
Poster: 147
Mentor(s): Shiwang Cheng

While more than 95% of the commodity polymers are semi-crystalline, tuning their crystal morphologies remains an important route to control the macroscopic properties of the semi-crystalline polymers. Incorporating particles into semicrystalline polymers to reinforce semicrystalline polymer nanocomposites is of no success due to the high impurities expelling nature of the crystallization process. In other words, the crystallization process is hardly affected by nanoparticles although the nanoparticles can be embedded into the crystalline domain or be expelled forming agglomerations. In the current study, we aim to study the effect of small-sticky nanoparticles to the crystallization kinetics of polymers. With a combination of differential scanning calorimetry, rheology, optical microscopy, and wide angle x-ray differaction (WAXD), we show the crystal nucleation and growth of poly(ethylene oxide) (PEO) are significantly affected by the presence of the silicotungstic acid nanoparticle (POM) (diameter D = 1 nm). In addition, both the morphology and the lattice structure of the PEO altered as evidenced by optical microscopy and WAXD. Although the origin in the changes of crystallization behavior remains unclear at this moment, we believe the small size of the nanoparticles plays a significant role.

ELECTROCHEMICAL RESPONSE OF DIAMOND MICROELECTRODES FOR CATECHOL AMINE NEUROTRANSMITTERS AND METABOLITES
Donte Williams
Category & Time: Chemical Engineering & Materials Science, Section 2, 1:00 - 2:15 PM
Poster: 148
Mentor(s): Greg Swain, Kirti Bhardwaj

Diamond Microelectrodes have the potential to be one of the most convenient devices for a wide variety of applications in electrochemistry and in the biological environment in general. Current and previous research has already exposed just how beneficial diamond can actually be when it comes to electrodes. My research focuses on how to eliminate the challenges associated with using diamond microelectrodes, in order to open up the opportunity for an expansion of applications in which diamond microelectrodes can actually be used. Perhaps making adjustments to the way in which we prepare the electrodes for use could be a potential solution to the problem. Whatever the solution may be, studying how to get rid of problems such as fouling and adsorption in diamond microelectrodes is a very worthwhile endeavor. Diamond microelectrodes have very useful applications in neuroscience and pharmacology, and our research is fueled by studies that have shown diamond microelectrodes to have the potential to measure particular neurotransmitters such as dopamine in the brain. By studying the particular characteristics of different types of electrodes, particularly boron-doped diamond microelectrodes, and testing the responsiveness of these electrodes in a variety of analyte solutions, I anticipate that we will be able to find the breakthrough that we are looking for.

EVALUATION OF NITROGEN-CONTAINING TETRAHEDRAL AMORPHOUS CARBON THIN FILM FOR THE ELECTROCHEMICAL DETECTION OF NITRIC OXIDE
Man Kuan Lei
Category & Time: Chemical Engineering & Materials Science, Section 2, 1:00 - 2:15 PM
Poster: 149
Mentor(s): Borys Hrinczenko, Greg Swain, Elahe Crockett-Torabi

Introduction: As part of a translational project that aims to develop a breath analyzer for the simultaneous detection of nitric oxide and peroxynitrite in exhaled breath condensate, we evaluated the performance of a nitrogen-containing tetrahedral amorphous carbon (ta-C:N) thin-film electrode as a sensing platform for nitric oxide (NO). The sensor performance was assessed using with voltammetric and amperometric detection methods. The sensor consists of nanoparticles of Pt overlaid with the polymer Nafion on the ta-C:N electrode. ta-C:N has only recently emerged as a potential material with excellent properties for electroanalytical applications. Methods: A three-electrode cell was used for both cyclic voltammetric and amperometric detection of NO. An NO solution with a concentration of 0.45mM was prepared and injected into the cell. NO oxidation current was measured at ca. 0.8V. Measurements were performed using a CHI650A electrochemical work station. Results: The ta-C:N electrode exhibited lower background current and noise than glassy carbon. We will report on the sensitivity, response variability, and the minimum concentration of NO detectable by NO sensor on ta-C:N as compared to glassy carbon.Conclusion: We speculate that ta-C:N will exhibit superior NO detection figures of merit compared with glassy carbon. ta-C:N can serve as an excellent electrode material

beyond the laboratory for its lower cost and easier pretreatment in comparison to other electrodes. Support: M.L. is a REPID scholar, supported by NIH-5- R25-HL108864 award to E.C., REPID-Program Director.

THE EFFECT OF SAMPLE SIZE ON CREEP IN NIMONIC 75

Alexander Hughes
Category & Time: Chemical Engineering & Materials Science, Section 2, 1:00 - 2:15 PM
Poster: 150
Mentor(s): Carl Boehlert, Martin Crimp

Nickel-based superalloys, such as Nimonic 75, are used extensively in jet turbine engines, nuclear engineering applications, and industrial furnaces, due to their strength and resistance to oxidation at high temperatures. Additionally, Nimonic 75 is certified as a reference for creep testing by the National Physical Laboratory. Creep deformation occurs at high temperatures over long periods of time as a result of thermally activated diffusion, and is the limiting factor in the lifetime for superalloys in these applications. Previous studies have found that samples with smaller volume to surface area (V/S) ratios creep faster than those with larger V/S ratios, at least for small amounts of creep deformation. Observations of electron backscatter diffraction (EBSD) pattern crystal orientation maps from these studies showed a grain size gradient from small at the surface to a larger base size. The objective of the current study is to determine the root causes for this grain size gradient. EBSD maps of creep-tested and non-creep-tested materials, as well as strained and non-strained materials, have been collected. Sample size was calculated using the linear intercept method. Vickers hardness was measured as a function of distance from the surface at about 50 μm intervals. These data will give insight in to the nature of the surface grains and the origin of the sample size effect and facilitate a better understanding of the material as a creep reference and creep deformation mechanisms.

COMPUTER SCIENCE & ENGINEERING

IMPACT OF NOISE ON IRIS SPOOF DETECTION ALGORITHMS

Seth Mckinstry
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 153
Mentor(s): Arun Ross

Biometrics is the measurement and statistical analysis of people's physical and behavioral characteristics. Biometrics systems utilize traits such as face, fingerprints, iris, vasculature pattern, voice, and DNA for recognizing individuals. Biometrics has applications in national security and in commercial products such as phones, tablets, computers, etc. Our work over the course of the summer focuses on iris recognition, where the goal is to modify an iris image digitally in order to fool an iris spoof detection system. A spoof detection system determines if the input iris image is real or spoof. Spoofs can be generated using fake eyeballs, cosmetic contact lenses, printed iris images or digital iris images displayed on a computer screen. Our approach adds noise to an iris that could confuse the spoof detection system. The noise is a sequence of random perturbations that distorts an image from its original state. A successful image will fool the spoof detection system causing a fake iris image to be detected as a real one and vice-versa. With the help of this research, computer scientists will effectively know how to combat spoof attacks and improve biometric security.

THE DESIGN AND IMPLEMENTATION OF A LOW-COST BITCOIN VENDING MACHINE

Harrison Fernandez
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 154
Mentor(s): Guan-Hua Tu

Bitcoin (BTC) is a virtual and anonymous cryptocurrency, that removes the middleman, such as a bank or central government, from a two-party transaction. A currency such as Bitcoin is important when third parties cannot be trusted. For example, Bank of America may be hacked at any time, which leaves our personal information and finances compromised. Instead of a middleman, Bitcoin uses secure mathematical proofs to ensure that transactions are valid. The process of verifying the proofs, or mining, forces BTC transactions to take much longer than those of cash or credit card - the average time is 10 minutes. This is why BTC is rarely used in time-constrained transactions. For quick vending machine transactions, Ethereum's "smart contract" functionality is utilized where a virtual contract describes that the customer will send the vendor an amount of BTC in exchange for an item in the vending machine. A low-cost vending machine is designed and implemented using an inexpensive, WiFi-enabled microcontroller and economical components: a serial monitor, servo motors, and buttons. The microcontroller connects to a server that is set to perform the

Bitcoin/Ethereum transaction, search for the transaction ID on the Ethereum network, and verify that the number of confirmations exceeds or is equal to 12. If greater than or equal to 12, the transaction is valid, and will vend the requested item. A low-cost vending machine demonstrates that Bitcoin can be implemented in a time-constrained environment, opening doors for normalized Bitcoin usage and functionality in small transactions.

APPLICATION OF A FAST SCHEME FOR TIME-FRACTIONAL DIFFERENTIAL EQUATIONS

Alysia Irwin
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 155
Mentor(s): Mohsen Zayernouri

The mechanical behavior of soft materials, e.g. biological tissues, polymers, gels has complex internal stress responses that follow power-laws in time. The same laws are observed in internal material degradation and failure because of load/temperature cycles and ageing effects. Accurate modeling and simulations involving complex materials is fundamental in, e.g., medical imaging for cancer detection, development of biomaterials, vibration control, and better life-cycle prediction of mechanical parts. We model the power-law response of soft materials through time-fractional differential equations (FDEs), which due to their integral-differential form, lead to direct numerical schemes with a computational complexity of O(N^2). Such computational cost makes the use of real-life applications with long time integration and large systems prohibitively expensive. To overcome this numerical challenge, we developed a MATLAB code that employs a fast convolution scheme with computational cost of order O(N log N) for a faster time-fractional integration. The main objective of this research plan is to employ the fast scheme to a class of FDEs for constitutive modeling of soft materials and test its limitations in terms of accuracy and extended time integration. The outcomes of the research will be a set of coded benchmark problems that will be part of a numerical library, for the code to be converted to C/C++, and a better understanding of the limitations of the scheme for future use in material fatigue applications.

ADAPTIVE MESH REFINEMENT FOR THE SMOOTHED BOUNDARY METHOD

Kieran Fitzmaurice
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 156
Mentor(s): Hui-Chia Yu

Many systems can be described as two or more domains of distinct phases or compositions separated by a thin interface. Modeling these systems is difficult because it often requires solving partial differential equations with boundary conditions on complicated or irregular boundaries. The smoothed-boundary method is a numerical technique that circumvents these problems by describing interfaces as diffuse regions where a phase-field-like parameter varies smoothly between values defining separate domains. This powerful method allows us to solve PDEs within boundaries of arbitrary geometry; however, a high-resolution mesh is needed to accurately describe very thin interfacial regions, which on a uniform grid becomes computationally expensive. In this project, we develop an algorithm for generating an adaptive Cartesian mesh for the smoothed-boundary method, with the goal of increasing the accuracy and speed of numerical simulations. We validate our algorithm against benchmark simulations applying the smoothed-boundary method on a fixed uniform mesh, and compare their accuracy and computational requirements to simulations performed using our adaptive meshing technique. In addition, we demonstrate how our methods can be applied to problems in fluid dynamics.

SEQUENTIAL RESAMPLING (SERES) OF BIOMOLECULAR SEQUENTIAL DATA FOR MULTIPLE SEQUENCE ALIGNMENT INFERENCE

Ahmad Hejasebazzi
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 157
Mentor(s): Kevin Liu

Motivation: A previous method called SERES (SEquential RESampling) was introduced to perform resampling of biomolecular sequential data using semi-parametric and non-parametric techniques assuming dependence between biological sites. SERES uses random walks over aligned and unaligned biomolecular sequences, and then re-estimation on resampled biomolecular sequences is performed. Re-estimated results are then compared as a means to assess statistical support. SERES has a wide range of biological applications. For example, SERES could be used to support inference methods of multiple sequence alignments, detecting signatures of natural selection, and introgression. While SERES uses semi-parametric approaches for resampling unaligned sequences, using completely

non-parametric approaches for resampling unaligned sequential data would provide more useful support estimations. One major issue with SERES is its computational complexity. This computational issue could be mitigated by applying the concept of parallel (distributive) computing to calculate the re-estimation of the replicates in a faster time complexity while accounting for the sequential dependence between sites.

MODEL RANKING AND VALIDATION CRITERIONS IN WORD EMBEDDINGS FOR BIOMEDICAL NPL

Jesus Vazquez
Category & Time: Computer Science & Engineering, Section 1, 1:00 - 2:15 PM
Poster: 158
Mentor(s): Arjun Krishnan

Machine learning (ML) has gained momentum as a critical component of Natural Language Processing (NLP), a suite of analytical techniques for discerning meaning from vast text corpuses. Specifically, learning word embeddings (numerical vector representations of words in high-dimensional spaces) has gained enormous popularity as a tool for deriving semantic relationships and similarities between words. However, the application of word embeddings and their subsequent interpretation is underexplored in the biomedical domain. In this research project, we explore the use of word embeddings to glean similarity and semantic relationships between biomedical entities (e.g. genes, cellular functions, diseases, and drugs) from PubMed, a corpus of 28 million biomedical abstracts produced over the past 52 years. We are specifically interested in testing the effect of Name Entity Recognition (NER) on the efficacy of the word embeddings in capturing previously-known relationships. We are also comparing different similarity scores and developing methods to assess how well these learned embeddings recapitulate various aspects of our prior biomedical knowledge.

GPU ACCELERATED TABU SEARCH FOR SOLVING MATHEMATICAL OPTIMIZATION PROBLEMS

Kwamaine Taylor, Antonio Segura
Category & Time: Computer Science & Engineering, Section 2, 1:00 - 2:15 PM
Poster: 162

Tabu search is a metaheuristic search method that uses adaptive memory and heuristic search methods to efficiently solve incomplete and imperfect optimization problems. This poster explores the feasibility of using tabu search with Cuda-Enabled GPUs (Graphics Processing Unit) to improve optimization results. The work presented in this poster investigates the improvements that tabu search can provide in parallel computing. We test various methods of tabu search to understand the correlation with cores to the improvement of optimization. It will show that tabu search improves speeds of optimization compared to both single-core and multi-core CPUs (Central Processing Unit). Conclusions will be drawn regarding the feasibility and performance of using tabu search on Cuda-Enabled GPUs.

USING DEEP LEARNING TO PREDICT LONG-RANGE REGULATORY NETWORKS BASED ON PROTEIN-PROTEIN INTERACTIONS

Albert Xue
Category & Time: Computer Science & Engineering, Section 2, 1:00 - 2:15 PM
Poster: 163
Mentor(s): Jianrong Wang

The vast majority of disease-associated genetic variants are located in non-coding regions, which represent more than 97% of the human genome. A systematic delineation of the mechanism by which such non-coding variants induce diseases requires accurate identification of downstream target genes whose expression levels are regulated by these variants in diverse tissues. Since these target genes are highly tissue-specific and are usually located far away in the 1D genome, prediction has thus far proven to be difficult. Previous studies have mostly focused on short-range regulation and are thus limited by low statistical power, overfitting across different tissues, and difficulties utilizing non-linear associations of multi-enhancer regulation. As a result, an efficient and robust machine learning algorithm is therefore needed to predict long-range links between regulatory elements and distal target genes via 3D chromatin interactions. Based on our preliminary analysis, we propose to leverage protein-protein interactions (PPI) as features to predict long-range chromatin interactions. We will integrate PPI, transcription factor binding, chromatin and epigenetic signals in order to fine tune a convolutional neural network under a transfer learning framework to achieve better accuracy on long-range regulation predictions. In addition, we will use our model to characterize the key PPIs that are important in establishing and maintaining tissue-specific regulatory links between enhancers and distal target genes, which will provide novel mechanistic insights on 3D chromatin structure formation. The predicted long-range regulatory networks will be a valuable platform in interpreting the functional roles of non-coding genetic variants and decoding the genetic basis of human disease.

EFFECTS OF MAGNETIC FIELD-ASSISTED FINISHING ON MOLD STEEL
Patrick Mccormick
Category & Time: Computer Science & Engineering, Section 2, 1:00 - 2:15 PM
Poster: 164
Mentor(s): Haseung Chung

The magnetic field-assisted finishing (MAF) process of finishing surfaces is an alternative to more traditional methods of finishing materials. Instead of a solid abrasive, the material used is a mix of a high viscosity binding agent, ferrous material, and abrasive particles. This mixture is held in place by a magnet which is then rotated across the surface of the workpiece by a CNC machine. This process is advantageous over traditional methods as the slurry can conform to the shape of the part being finished, which allows for automated finishing of more arbitrary geometry. The purpose of our research was to explore the main characteristics of the MAF process as well as the physics causing the results. The experimental design involved varying the size and type of the abrasive particles, followed by measuring the surface roughness value. MAF was found to effectively smooth out surface imperfections on the ferrous materials but requires more development to increase material removal rate and surface penetration.

MACHINE LEARNING FROM QUANTUM CHEMISTRY
Muawiz Chaudhary
Category & Time: Computer Science & Engineering, Section 2, 1:00 - 2:15 PM
Poster: 165
Mentor(s): Matthew Hirn

Electronic structure problems are key to many insights in a wide variety of scientific fields, including chemistry, materials science, and drug discovery. Current ab initio methods, such as density functional theory (DFT), for calculating the ground state electronic density of a system and its corresponding energy are computationally expensive. To reduce the computational costs, machine learning techniques have recently been applied to compute the ground state energy and, in a few cases, the electronic density as well. In this work we introduce a technique for calculating the ground state electronic density at a reduced computational cost relative to DFT. Our method utilizes tools from optimal transport and uses a machine learning model reminiscent of a conditional adversarial network with a U-net architecture.

THE ROLE SOCIAL MEDIA CAN PLAY IN BEING ACTIVE
Austin Roberts
Category & Time: Computer Science & Engineering, Section 2, 1:00 - 2:15 PM
Poster: 166
Mentor(s): Charles Owen

The industry built around social media has evolved since the inception of the internet. Starting with basic web pages in the late 90's, the internet has progressed at a rapid rate in terms of technology and accessibility. Social media platforms have redefined the way people use cell phones and we are now more connected than ever. It has been seen that sites like Facebook, Instagram, and Twitter can promote social and digital interactions between users, but what about physical interactions? We have set out to build a social media site that keeps track of its users; number of steps they take each day through FitBit's Web API. Participants in this study will be using FitBit devices that will track the number of steps they take each day, which we then pull from FitBit's server. We will be able to organize the users into teams and allow them to compete in step challenges that will require them to be running and moving around outside. Because the study is still being organized and set up, the results are still incoming.

FITTING ICE-CUBE NEUTRINO PATH MODELS USING NEURAL NETWORKS
Mohammed Mohammed Salih
Category & Time: Computer Science & Engineering, Section 3, 1:00 - 2:15 PM
Poster: 169
Mentor(s): Dirk Colbry

Neutrinos are small particles with a mass close to zero. Its rare interaction with normal matter makes it difficult to determine its precise mass. Researchers in the the Ice Cube project are working on determining neutrinos precise mass. The Ice Cube project is a sub particle detector in the southpole that records the interactions of neutrinos. The detector is a 150 KM grid with a hexagonal shape 1 km under Ice. Each hole in the grid has a 1 km string, each with about 60 light sensors. Since a neutrino is faster than the speed of light in ice, it emits light in ice. Therefore, the emitted photon is detected by the sensors in the detector. Using the measurements from the detector, we can determine angle, origin, speed, and energy using analytics and machine learning. The interest in this project is to identify neutrinos have come

from the center of the galaxy. To check if machine learning is an appropriate method for this project, we create a virtual ice cube simulator using phantom data generation method to simplify and control the data set. Then we use machine learning on this data to determine if it is an appropriate method for this problem.

AN ANALYSIS OF SIGNED, BIPARTITE NETWORKS TO IMPROVE LINK PREDICTION

Cassidy Johnson
Category & Time: Computer Science & Engineering, Section 3, 1:00 - 2:15 PM
Poster: 170
Mentor(s): Jiliang Tang

Signed, directed networks such as those representing online trading networks are currently a fertile area of network science research as they can yield better prediction algorithms and enhance the suggestions provided to an online user. Previous studies indicate that the behavior of a network over time can be predicted using social science theories such as balance theory and status theory, which leads us to ask our research question: How can we extend balance theory to bipartite networks in order to improve link prediction algorithms in signed networks of homogeneous users? In this study, we will use balance theory, a social science theory that suggests that relationships will follow the common rationales, "the enemy of my enemy is my friend", "the friend of my friend is my friend", etc. Balance theory also claims that wedges, or almost complete cycles, will be completed in a way that is balanced with much more frequency than in a way that is unbalanced. We propose slight modifications of balance theory to apply it to four cycles in a bipartite, online trading network called Bonanza in order to create a link prediction algorithm among more complicated networks. We will create a matrix of the ratings given by buyers and sellers and use machine learning to produce a weighted average in order to anticipate the rating that a user might give. We will remove a small test group from the data and use the remaining data to attempt to predict the behavior of the test group. We expect that our results will match the actual test group data. Our analysis of the data includes power law degree distributions, calculations of the probability of reciprocal links, and factorization of the previously discussed matrix. If our results agree with our hypotheses, we can conclude that balance theory can be extended to model bipartite, signed networks.

LINKING DISEASE-ASSOCIATED GENETIC VARIANTS TO GENES USING SEQUENCE AND 3D CONTACTS

Chinaza Nnawulezi
Category & Time: Computer Science & Engineering, Section 3, 1:00 - 2:15 PM
Poster: 171
Mentor(s): Arjun Krishnan, Jianrong Wang

The basis of human nature is ultimately the central dogma of biology. The major processes in the central dogma include replication, transcription, and translation. The transcription of genes is regulated by promoters and enhancers. Epigenetic modifications changes such as histone modifications have been shown to assist in locating these enhancers and promoters across the genome. Due to the complex, nonlinear structure of DNA, promoters and enhancers can affect genes from a long distance. It is currently known that humans share over 98% of their genome with one another. Along the human genome, there are millions of locations that contribute to most of the differences between the genomes in the individual. Due to an increase of Genome Wide Association Studies (GWAS) within the past decade, many SNPs have been identified in association with many diseases and traits. Programs such as Pascal and VEGAS have been made available to analyze the data from GWAS. The purpose of this study is to explore two sources of data to ultimately connect SNPs with their associated genes. One method includes utilizing the proximity of SNPs to genes along the linear genome, and the second method is to use the 3-dimensional contacts of these polymorphisms with certain genes which are a result of the complex folding within the genome. Once these connections between the SNPs and genes are established, this information can be used to do further analysis of cellular pathways and processes that make up complex diseases.

PRESENTATION ATTACK DETECTION IN IRIS RECOGNITION

Madison Bowden

Category & Time: Computer Science & Engineering, Section 3, 1:00 - 2:15 PM
Poster: 172
Mentor(s): Arun Ross

Biological traits, such as fingerprint, iris and face, are increasingly being used to recognize individuals in a wide variety of applications such as authenticating smartphone users. However, these biometric systems are vulnerable to presentation attacks (PAs), in which an adversarial user deliberately attempts to deceive, or spoof, the system by presenting false biometric traits to the sensor to obfuscate their own identity or assume that of an authorized user. Examples of iris PAs include printed irises, prostheses, images on electronic displays, and cosmetic contacts. To prevent such attacks, the Iris Presentation Attack Detection team is developing solutions to determine whether an iris sample is genuine or spoof. While the iris image is being acquired, external hardware, such as a webcam, can analyze the scene and identify anomalous interactions, e.g., a user occluding their eye with a prosthetic. Another solution works after an image is captured, where deep convolutional neural networks (CNNs) take sampled patches from the iris and periocular regions, and extract features and generate a presentation attack score in the interval [0,1]. These scores are then fused together. The team continues to work on creating more robust and generalizable solutions to counteract novel attacks.

DYNAMIC JUMP SEARCH

Jacob Marcus, Sorrachai Yingchareonthawornchai

Category & Time: Computer Science & Engineering, Section 3, 1:00 - 2:15 PM
Poster: 173
Mentor(s): Eric Torng

A common and well-studied problem in computer science is to design a data structure that can be searched and updated quickly as well as perform sequential operations and produce ordered output. Many solutions exist including self-balancing binary search trees and B trees. However, these solutions tend to access memory at random through searching or rebalancing and thereby minimize the impact of caching. Jump Search is a fast sequential search algorithm that leverages caching by performing lookup on contiguous blocks of memory, but it does not support fast update. To remedy this, we introduce a new data structure, the Jump Search Tree, which uses a variant of a B+ tree as a black box to allow for dynamic jump searching. Our goal is to show this new data structure has faster search, update, and sequential access than state-of-the-art searchable data structures. To do this, the Jump Search Tree will be compared against standard balanced binary search trees and B trees using the metrics of search time, update time, and sequential access time. Comparisons will be made using varying amounts of randomly generated key-value pairs. Preliminary testing has shown that the Jump Search Tree is nearly twice as fast as B+ trees and Red-Black trees in all metrics on large datasets. In this presentation, the Jump Search Tree data structure will be discussed in detail and possible improvements and applications will be suggested.

ELECTRICAL & COMPUTER ENGINEERING

DECENTRALIZED PORTABLE SMART HOME SECURITY SYSTEM

Gustavo Camero

Category & Time: Electrical & Computer Engineering, Section 1, 1:00 - 2:15 PM
Poster: 176
Mentor(s): Andrew Mason

A Smart Home is house that enables total control, flexibility and management over the home appliances for its user using wireless connectivity. These home appliances have integrated circuits that are able to monitor and regulate the home appliance by wirelessly sending data to the smart home system. Smart houses can be beneficial for elder care such as fall detection and for disable people with total control. However, the implementation of a smart home system requires a remote application platform to process data and notifications that can cost around $2000 plus subscription for server maintenance. This makes the development smart home systems very complex, expensive, and third-party dependable. Henceforth, a decentralized portable smart home security system can be implemented to disable the need for third-party dependency by decentralizing the system and to lower the cost of smart home systems by using the process of miniaturization. The basic functionalities of smart home security system are to offer security and remote monitoring to its user while also maintaining low cost and energy efficiency. We anticipate that miniaturizing the system will save energy since electronic components used are low cost and energy efficient specifically the system will cost around $100 which competes against other portable systems such as Sens8 ($139.00) and Canary ($169.00) while the

expected power consumption of the system is less than 8 watts. Furthermore, we expect the system to become affordable and easy to use for the general audience since there will be no need for installation or subscription-based server maintenance.

HARDWARE IMPLEMENTATION OF CONVOLUTIONAL NEURAL NETWORKS
Leah Espenhahn, Catherine Javier
Category & Time: Electrical & Computer Engineering, Section 1, 1:00 - 2:15 PM
Poster: 179
Mentor(s): Daniel Llamocca

Convolutional Neural Networks (CNNs) are primarily run on high-end processing computers. This work explores creating custom pipelined hardware for the main stages of a CNN for image classification: convolution, rectification (ReLU), and pooling of images, with the ultimate goal of creating custom hardware for all CNN stages in order to optimize the hardware for analyzing and detecting objects in images. VHDL is used to design the custom hardware components (convolution, ReLU, and pooling); then this hardware description is to be mapped onto a field-programmable gate array (FPGA). For hardware verification, the outputs of custom hardware implemented on an FPGA are compared to the outputs of floating-point model in MATLAB. A final aim is to investigate the feasibility of designing custom hardware to implement the fully connected layer (neural network), which will enable the design of a complete hardware architecture for a CNN.

AUTONOMOUS SURFACE CRAFT AS A PLATFORM FOR ENVIRONMENTAL SENSORS
Robert Billette, Chandler Panetta
Category & Time: Electrical & Computer Engineering, Section 1, 1:00 - 2:15 PM
Poster: 180
Mentor(s): Xiaobo Tan

Mapping the terrain of the seafloor and other bodies of water can reveal a number of interesting features useful to geologists, biologists, archaeologists, and others. In fact, the sensing and measurement of the environment is of paramount importance to understanding some pressing challenges humans are currently faced with, such as climate change, invasive species, and tectonic behavior, to name a few. This project focuses on an autonomous surface craft (ASC) as a platform to contain remote sensing electronics, specifically a towable sidescan sonar, for unmanned missions to capture environmental data. The small and maneuverable nature of this ASC is ideal for inland bodies of water, namely lakes and rivers. And its low power consumption allows for large scale surveys of multiple hours, or even days. The utilization of a towable sonar unit as opposed to a mounted sonar unit allows for unique advantages including improved range resolution and adjustable tow depth. A tethered link between the ASC and sidescan sonar is used to transfer raw image data to an onboard ODroid-C2 companion computer for storage and post-mission data processing. Both manual and automatic control of the ASC are done through the open source software Mission Planner, using a Pixhawk flight controller. With the current telemetry modules, a connection range of up to a mile can be obtained. Future goals include the employment of solar panels for battery recharge, real time sonar image generation, and longer telemetry range.

OPTIMIZATION OF ELECTROMAGNETIC COUPLER DESIGN FOR HIGH FREQUENCY OPERATION
Adam Gleichman
Category & Time: Electrical & Computer Engineering, Section 1, 1:00 - 2:15 PM
Poster: 181
Mentor(s): Ahmet Ulusoy

Our goal is to create a ultrawideband coupler to be implemented in an antenna array in the future. After a through literature review, we narrowed down possible design options to a simple multilayer microstrip coupler to save space while still performing at a center frequency in the Ka-band (26 GHz to 40 GHz) or V-band (40 GHz to 75 GHz). Advanced Design Systems 2018 Software and Ansoft HFSS were used to test designs for our need specifications.

CHARACTERIZATION OF BRAIN CONNECTIVITY NETWORKS DURING ERROR-RELATED NEGATIVITY
Zoe Dittman
Category & Time: Electrical & Computer Engineering, Section 2, 1:00 - 2:15 PM
Poster: 184
Mentor(s): Sara Aviyente

Excessive and persistent anxiety represents one of the most prevalent mental health problems in the United States. Therefore, it is important to understand the underlying cognitive sources of anxiety. One especially active area of neuroscience research aimed at tackling this issue has focused on how anxiety is related to error monitoring. A growing body of research indicates that anxiety is associated with enhanced amplitude of the error-related negativity (ERN) of the human event-related brain potential (ERP), suggesting that anxiety is associated with exaggerated error monitoring. In addition, recent research has shown that increased worry has an association with an increase in functional connectivity in the pre-frontal cortex. In this research, we focus on the variations in anxiety levels both behavioral and physiological in a female population across the menstrual cycle. In order to quantify the changes in brain connectivity patterns across time, we implement proven methods such as computing phase synchrony values and assessing different graph theoretic metrics on the resulting networks. Performing a statistical analysis of these metrics at different times in the menstrual cycle, we should be able to determine if there is a strong association between hormonal levels and ERN, and which specific brain regions contribute to these changes.

ARTIFICIAL INTELLIGENCE: HUMAN ROBOT INTERACTIONS
Ittaty Aguilar-Guzman, Valesia Davis
Category & Time: Electrical & Computer Engineering, Section 2, 1:00 - 2:15 PM
Poster: 185
Mentor(s): Wing-Yue Geoffrey Louie

Robots are widely used in many industries including manufacturing, healthcare, service, space, social personal robotics, and education. Our main goal for our lab project is to program the NAO Robot to encourage people to engage in more healthy activities such as; taking a walk, drinking more water, eating healthier foods, and exercising. The NAO robot is the most commonly used humanoid robot for multiple purposes. It is also fully programmable to execute human like actions, for instance, walking, talking, listening, and recognising facial features. With the use of different programs like Robotic Operating System (ROS) and Python we are able to create messages and codes in order for the NAO robot to implement those actions.

DEVELOPMENT OF IN VIVO PROGRAMMABLE ROBOTIC SWARMS
Daniel Martinez
Category & Time: Electrical & Computer Engineering, Section 2, 1:00 - 2:15 PM
Poster: 186
Mentor(s): Vaibhav Srivastava

Swarm robotics is an increasingly relevant area of research in which groups of robots interact with each other and collaborate to achieve a goal. This concept is inspired by the collective behavior of natural swarms such as flocks of birds and ant colonies. The applications are very broad, including but not limited to search and rescue, object transport, surveillance, and modular assembly. However, creating a scalable swarm of robots remains a challenge. Existing systems have limited inter-robot communication capabilities and are unable to test exogenous factors such as human supervision and environment modification within the test-bed. To address these issues, we are designing and constructing robots with enhanced communication abilities at a low cost to demonstrate that these changes enable a more scalable swarm. We are using an ESP8266 wireless module paired with an Arduino microcontroller to be able to transfer more information between the swarm and a central server and to be able to reprogram the swarm during operation. We hope to show that these improvements in capability facilitate the issue of scalability and leads to the development of larger scale swarms of robots.

OPTIMIZATION OF FUEL SUPPLY AND BATTERY CAPACITY FOR GAS-ELECTRIC HYBRID DRONE
Alyssa Lalko, Dana Bigham
Category & Time: Electrical & Computer Engineering, Section 2, 1:00 - 2:15 PM
Poster: 187
Mentor(s): Osamah Rawashdeh, Yazen Alali

Due to the energy density limitations of lithium polymer batteries, drones that utilize gasoline have potential to achieve longer flight times and increased payload-carrying capabilities. However, due to the low responsiveness of engines, these unmanned aerial vehicles (UAVs) cannot be solely propelled by gasoline. Thus, hybrid UAVs are promising. In our research, the optimal battery capacity and fuel supply was determined for a novel gas-electric hybrid drone. The hexacopter built for this test is comprised of separate electric and gasoline propulsion systems. Because there are various potential configurations for hybrid UAVs, this setup is largely unexplored. Four battery-operated electric motors and two gas-powered internal combustion engines each run their own propeller. Data was collected by running the UAV at an RPM that corresponds to hovering 1 foot off the ground. At five minute intervals, the weight of the remaining gas was recorded to determine the gasoline consumption rate. Simultaneously, data from the battery was collected via the flight controller. From this data, the optimal battery capacity and fuel supply was determined. These findings eliminate unnecessary weight, thus increasing flight time. Furthermore, the method developed can be applied to future tests regarding optimal battery capacity and fuel supply for various payloads. In this presentation, we will discuss the unique hybrid configuration of our UAV, our method of optimization, and present our results.

LOW-COST RADAR SYSTEM TO REMOTELY MEASURE RESPIRATION AND HEART RATE
Sujeily Fonseca-Gonzalez
Category & Time: Electrical & Computer Engineering, Section 2, 1:00 - 2:15 PM
Poster: 188
Mentor(s): Patrik Chatterjee, Jeffrey Nanzer

The main purpose of this project is to measure respiration and heart rate using a low-cost 24 GHz radar-based system. A short-range dual channel Doppler radar module will be used for gathering signal information. Doppler radars are specialized radars that use a Doppler frequency shift, which is caused by a moving object relative to the wave source, to obtain velocity information about the object. The project aims to prove that, using the same principle of frequency or phase shift, small physiological movements such as breathing or the heart's beating, can be detected by the radar without being in direct contact with the body. This project combines wireless technology and biomedical engineering to remotely measure biometrics from people and animals, so that doctors and veterinarians can serve their patients more effectively. The focus of the first phase of this research project is to design, construct and test the radar-based system. The second phase would involve a signal processing methodology to extract and analyze biometric information. The proposed design will lead to potential low-cost applications, such as: searching for survivors after an earthquake, detection of abnormal breathing condition on sleeping infants or adults, prevention of Sudden Infant Death Syndrome (SIDS), among others.

TRACKING LOWER LIMB MOVEMENT USING AN INTEGRATED SENSOR APPROACH
Logan Schexnaydre, Ashley Burr
Category & Time: Electrical & Computer Engineering, Section 3, 1:00 - 2:15 PM
Poster: 191

Inertial Measurement Units (IMU's) and flex sensors are frequently used to track human body movements for the use of virtual reality gaming and sports performance analysis. Our research aimed to specifically create an IMU tracking system on the lower limb. By doing this, we have researched alternative, minimalistic, and cost-effective methods for tracking movement. To begin, we used 6 Sparkfun 9DoF Razor IMU's to track the movement of a single leg while jogging. We then analyzed the IMU data using MATLAB and Simulink. To do this, we attached a micro SD card and lithium polymer battery to each IMU. We then jogged a lap to collect the movement and downloaded the micro SD card data to MATLAB. Once downloaded, we viewed the data from MATLAB. To try and minimalize the number of sensors on the lower limb, we then removed up to 3 of the IMU's and compared the accuracy of the results to the 6-sensor approach. From there we added a 4.5; flex sensor on the knee joint in an effort to make our system more accurate. The information retrieved from the sensor helped us better locate the position of the knee during the jog. This work required us to learn the basics of circuitry and programming to correctly analyze the data collected on the sensors, and how to integrate the data in a manageable, readable way.

OPTIMIZING SHEAR WAVE PARAMETERS IN VISCOELASTIC ULTRASOUND SHEAR WAVE PHANTOMS
Luke Wiseman
Category & Time: Electrical & Computer Engineering, Section 3, 1:00 - 2:15 PM
Poster: 192
Mentor(s): Robert McGough

Shear wave elasticity imaging is a form of ultrasound imaging in which an acoustic radiation force push beam is used to deform tissue, causing a shear wave to propagate outwards from the focal point of the push beam. In the context of shear wave elasticity imaging, there is a need to efficiently determine the shear elasticity and shear viscosity of viscoelastic media, especially soft tissue. Cancer detection is made possible due to the fact that tumors are typically stiffer than surrounding tissue, which can be detected in the form of a change in shear elasticity or viscosity. To enable multiple rapid calculations for parameter optimization, Green's function calculations of shear waves induced by an acoustic radiation force in viscoelastic and elastic media are accelerated by graphics processing units (GPUs). In these calculations, the shear wave particle displacement is computed by convolving the Green's functions for Navier's equation in viscoelastic media with the acoustic radiation force in time and space. The calculation results are compared to shear wave particle displacements measured with a Verasonics system, and then the shear viscosity and shear elasticity are determined by minimizing an objective function. Results are shown for three different shear wave phantoms with previously unknown shear elasticities and shear viscosities. Close agreement is observed between the simulated and measured shear wave particle displacements, particularly for the smaller values of the shear viscosity.

PERMEABILITY OF 3D PRINTED FERROMAGNETIC MATERIAL
Tia Smith
Category & Time: Electrical & Computer Engineering, Section 3, 1:00 - 2:15 PM
Poster: 193
Mentor(s): Shanelle Foster

The application of Additive Manufacturing, also known as 3D printing, is limitless, especially in the aid of making products used in aircrafts and automobiles. The ability to create complex geometries is the primary benefit additive manufacturing has to offer. Additive manufacturing may aid in realizing new electric motor designs with complex shapes. Electrical steel laminations have limited flexibility when used in unconventional motor designs. The ability to 3D print ferromagnetic material with favorable magnetic properties may enable more efficient electric motor designs. High magnetic permeability improves the conductivity of magnetic force and the torque density of electric motors. In this project, the magnetic properties of nine binder jet printed ferromagnetic samples are experimentally evaluated. The magnetic properties of interest are magnetic saturation, magnetic flux density, coercivity, and permeability. The focus of this work is the magnetic permeability. Sensitivity analysis is used to identify the process parameters that have the most significant impact on the magnetic permeability. This work can potentially accelerate the development of high performance 3D printed electric motors.

AUXILIARY SENSORS FOR EMPATHY ENHANCEMENT IN SOCIAL INTERACTIONS
Ryan Aridi
Category & Time: Electrical & Computer Engineering, Section 3, 1:00 - 2:15 PM
Poster: 194
Mentor(s): Andrew Mason

Humans are intrinsically social beings. Empathic interactions between individuals shape and determine our relations in groups as well as in society as a whole. A key aspect of this social interaction is communicating explicit and implicit emotional responses and statuses. Therefore any person who cannot empathize with, or gauge, the emotional state and response of others -due to a disability, disease, lack of proper training, etc- will be at a loss in making ample and fulfilling social connections/relationships, which could be detrimental over time. It is the goal of this study to develop a device that can detect the other parties emotional state and communicate that information to the wearer. This would allow those without typical emotional sensitivities to operate with less difficulty in our empathic society. It would also be possible to use this device as a teaching/training tool for professional environments to cultivate team culture, maximizing workforce throughput.

REFERENCE POINT BASED MANY-OBJECTIVE OPTIMIZATION USING EVOLUTIONARY ALGORITHMS

Yash Vesikar
Category & Time: Electrical & Computer Engineering, Section 3, 1:00 - 2:15 PM
Poster: 195
Mentor(s): Kalyanmoy Deb

The power of evolutionary multi-objective algorithms (EMOs) can clearly be seen in their ability to solve many-objective optimization problems in a single run. By converging onto a complete multi-dimensional Pareto-optimal frontier, EMOs have the ability to provide a decision-maker (DM) with a representative set of multiple possible solutions. However, decision-makers usually do not have adequate time to evaluate many solutions to choose a single preferred solution. It is more practical to find solutions at certain preferred regions of the Pareto frontier, rather than finding the complete set. In this study, we focus on the idea of a preference-based search in which the DM has the ability to provide one or more reference points within their regions of interest. Our algorithm, R-NSGAIII, is an extension on reference-based search algorithms that have been proposed in the past with an addition to ensure that all reference points are more evenly preferred within the population by the use of a niching operator. In order to quantitatively compare our proposed method to other preference-based optimization algorithms, we evaluate the results using various reference point-based metrics. This will enable a decision-maker to quantifiably compare the results from various preference-based optimizers. We see potential in this work and are excited to see its applications and continued research in this field.

ENVIRONMENTAL SCIENCE & NATURAL RESOURCES

INVESTIGATING ANTIHERBIVORY EFFECTS OF STRUCTURALLY DIVERSE ACYLSUGARS

Cristian Sanlatte
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 198
Mentor(s): Yann-Ru Lou

Pesticides have been applied excessively in tomato production. The many undesired outcomes these chemicals pose on public health led to active research to find alternative methods for pest control. Like most plants in the tomato clade of Solanum, *S. pennellii* and *S. habrochaites*, possess hair like protrusions that produce various specialized metabolites. Among them, acylsugars have been linked to plant defense against herbivory. Acylsugars are composed of a sugar core, generally a sucrose ring, and diverse types of acyl chains varying both in chain length and their respective positions on the sugar core. The amounts and types of structures of acyl sugars can differ largely between and within species; however, the relationship between their structures and anti-herbivory activity is not fully understood. In this study, we utilized a variety of genetically modified plants as well as natural accessions to compare the effects of different types of acylsugars on plant defense against *Manduca sexta* caterpillars. Acylsugars were extracted and analyzed by liquid chromatography-mass spectrometry (LC-MS). Their insecticidal properties were measured by larvae weight gain and death rate during no-choice assays on artificial diet supplied with plant extracts. We used these results to correlate insect performance to accumulation of metabolites. The data generated in this study will provide preliminary results on the structure-function relationship of acylsugar as an insecticide and also establish a system for evaluating the anti-herbivory function of different acylsugars.

HOW CHARACTERISTICS OF A RESTORATION AFFECT POLLINATION OF RESTORED PLANTS

Alexandrea Peake
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 199

Due to habitat loss and degradation, many species of pollinators are declining in abundance and this can have impacts on rates of pollination in natural and managed ecosystems. Habitat restoration can be useful in rebuilding ecosystems, but often focuses only on plant community reestablishment, with non-plant components of ecosystems, such as pollinators and pollination, often assumed to reestablish passively. Yet, restoration outcomes are notoriously variable and little is known about whether or why rates of pollination may vary among restoration efforts. We tested what variables affect pollination rates among restored prairies in southwestern Michigan, testing biomass, floral cover, landscape, site size, site age, management and fire history. We did this using a sentinel plant approach, grew 120 individuals of a native annual prairie forb (Chamaecrista fasiculata) in a greenhouse. Chamaecrista was chosen because it is buzz pollinated and thought to be mostly outcrossing. Once they started flowering we put four out in each of 17 restored prairies. After one week, we moved plants to a greenhouse, and allowed them to produce seeds. We then

evaluated rates of seed set per flower as a function of measured field variables to evaluate mechanisms for variation in pollination between the restored prairies.

ANDEAN BEAR CONSERVATION: ARE WE LOSING BIODIVERSITY HOT SPOTS?
Krymsen Hernandez
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 200
Mentor(s): Phoebe Zarnetske

Due to rapid global change, especially in biodiversity hotspots, there is a need to set more realistic conservation goals that maximize conservation efforts for a specific area. Identifying geographic distributions of species by utilizing species distribution models (SDMs) is a key tool for establishing protected areas. Currently, many conservation initiatives and plans for new protected areas are focused on societal preferences for charismatic species, particularly in biodiversity hotspots such as the Northern Andes. This umbrella species approach, though effective at raising funds and bringing attention to conservation issues, has the potential to leave out select regions of high biodiversity and some species that have important ecological functions. To address this issue, we will generate a species distribution model for a charismatic species in the Northern Andes, the spectacled bear (*Tremarctos ornatus*), and assess how much of the range is covered by protected areas. In comparison, we will generate a species richness map of frugivores, which are important species for seed dispersal in the same region, and quantify the areas of high species richness also protected by national parks and private reserves. By contrasting both maps, we will observe if protected areas are focused on the Andean bear, and by design, if their locations leave out areas of high biodiversity, which could potentially lead to loss of biodiversity in the future.

POLLEN ANALYSIS OF LEAFCUTTER BEES, MEGACHILE (HYMENOPTERA: MEGACHILIDAE)
Michael Killewald
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 201
Mentor(s): Rufus Isaacs

To feed the ever-growing human population, farmers are expanding their fields to meet nutritional demands. Although this provides a benefit to the human species, it decreases the amount of resources available to pollinators by removing diverse native habitats and replacing them with monocrop fields. This is concerning because pollinators attain most of their resources from natural habitats. Since many of these important resources have been depleted, it has become increasingly necessary to identify which floral resources are most beneficial to pollinators and to encourage the use of these resources through pollinator conservation programs. If pollinators are unable to find enough pollen to support themselves and their offspring, it may lead to a reduction in pollinator abundance and may negatively influence crop yield. To identify which pollen types are primarily used for offspring provisioning of *Megachile*, four nesting boxes containing 250 stem nests of various sizes and materials were placed at the Michigan State University Clarksville Research Center in early May 2016. From May-July a total of 1581 *Megachile*cocoons were released to encourage nesting. These boxes were checked weekly from May until October for completed stem nests. Completed stem nests were removed and individual pollen provisions were processed using acetolysis and placed onto slides to examine defining characteristics of the pollen grains within. Pollen provision slides were compared with plant reference slides to determine the proportion of each individual pollen type in stem nest provisions. It was also determined that nesting females gathered pollen primarily from Trifolium spp.

THE EFFECTS OF DISTURBANCE ON BIODIVERSITY WITHIN ECOLOGICAL NETWORKS
Cameo Chilcutt
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 202
Mentor(s): Phoebe Zarnetske

Disturbance has the ability to produce long-lasting ecological legacies in a given environment. Quantifying disturbance history and dynamics of a given landscape enables deeper understanding of ecological changes in the past, present, and future. In order to explain ecological trends across established ecological networks such as the National Ecological Observatory Network (NEON) and Long Term Ecological Research Network (LTER), comparative and standardized cross-site disturbance variables are needed. In this study, we compiled land-use and disturbance history at co-located NEON and LTER sites, generated new disturbance variables, mapped those variables at NEON organismal data collection sites to visualize their spatial overlap, and analyzed species richness in relation to disturbance patterns in time and space. The product of our research includes: (1) open access R scripts that process spatial and temporal land cover, land use, and disturbance data over the last 30 years; and (2) a spatial and temporal database with standardized

disturbance variable capturing environmental change at a subset of research sites. The scripts will jumpstart the standardization of disturbance variables across all co-located NEON and LTER sites in the United States. Ultimately this database will help scientists make better inferences about ecological changes within these networks.

ELECTROACTIVATED ALKYLATION OF AMINES WITH ALCOHOLS VIA BORROWING HYDROGEN METHODOLOGY

Gabriela Keeney
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 203

C-H activation has emerged as a powerful tool in synthesis of medicines, industrial materials and natural products and has the potential to revolutionize organic chemical industries.1 In this work, H/D exchange shows that C-H bonds adjacent to -OH or -NH2 groups can be electrochemically activated over catalytic electrodes. 1 Though useful in their own right, these deuteration studies also uncovered a mild, electrocatalytic method for alkylating amines with alcohols. This reaction is essentially an electrochemical version of the borrowing hydrogen methodology. Methanol, primary, secondary, and bulkier alcohols such as cyclohexanol and benzyl alcohols all readily alkylate simple secondary amines such as pyrrolidine. Via alkylation of ammonia, lab staples triethylamine and N,N-diisopropylethylamine (Hunig's base) are easily made from the corresponding alcohols. Many active chemicals, pharmaceuticals, herbicides, conducting polymers and components of organic diodes contain alkylamines. For many years, compounds in this class have been made via classical methods such as amide or nitrile reduction, reductive alkylation, and electrophilic alkylation. These conventional methods have been improved over the years, but they suffer from several disadvantages: (a) the use of alkyl halides or strong reducing agents which are less benign to the environment, (b) the generation of wasteful salt byproducts and (c) lack of selectivity which leads to the formation of quaternary ammonium ions. Electroactivated reductive alkylation of amines with alcohol and water as solvent provides a new and a more benign approach for the synthesis of alkylamines.

LIGNIN CHARACTERIZATION: IDENTIFYING PRODUCT RELEASE FROM BIOMIMETIC TREATMENT OF LIGNIN FOR THE REPLACEMENT OF PETRO FUELS AND CHEMICALS

Juliet Foote
Category & Time: Environmental Science & Natural Resources, Section 1, 1:00 - 2:15 PM
Poster: 204
Mentor(s): Eric Hegg, James Jackson

Lignin, as the second most abundant natural polymer in the world, holds great potential to be utilized as a carbon neutral, renewable source of energy that could serve as a substitute for a depleting stock of petrol fuels and chemicals. Lignin, however, in its natural polymeric form is far less energy productive than petrol fuels; thus, effective schemes for depolymerizing lignin must be devised before it can be seriously considered for use on a nationwide scale. The depolymerization of lignin via cleavage of β-O-4 bonds (the most prevalent linkage found in lignin) has shown to be easily executed via a biomimetic SN2 reaction with organic thiols such as dithiothreitol and β-mercaptoethanol in our lab. In depth analysis must be performed for identification and quantification of the monomeric cleavage products which will determine the effectiveness of the biomimetic lignin depolymerization. Analysis techniques include P-NMR, H-NMR, GCMS, HPLC, GPC-HPLC, elemental analysis, compositional analysis, and mechanistic understanding with the use of computational analysis. Once yields can be effectively determined, the β-O-4 cleavage process can be scrutinized for improved efficiency and industrial viability.

EPIDEMEIOLOGY & PUBLIC HEALTH

SHIGA-TOXIN PRODUCING ESCHERIA COLI COLONIZATION MAY BE LINKED TO VARIANCE IN COW GUT MICROBIOME

Yamini Vepa
Category & Time: Epidemiology & Public Health, Section 1, 2:30 - 3:45 PM
Poster: 207

The gut microbiome has been associated with health due in part to the ability of bacteria to modulate the immune system and generate nutrients for the body. Pathogens, such as Shiga-toxin producing *Escherichia coli* (STEC), have the capacity to colonize and disrupt the normal flora of the gut microbiome leading to illness. A population of cows was selected to assess the effects of STEC and corresponding environmental factors. 174 beef and 145 dairy cows were selected to look at the effect of diet, living conditions, and STEC colonization status. *Firmicutes* (45%) and *Bacteroidetes*

(27.6%) were found to compose most of the microbiomes of both beef and dairy cows. *Proteobacteria*, a taxa commonly associated with disease, was found to be in higher abundance in dairy cows, whereas *Spirochetes* were found to be in higher abundance in Beef cows. Dairy and Beef cows had comparable alpha diversity measurements (Chao1 richness α-diversity 3328 vs 3211, respectively). As of now, STEC colonization status was attributable to differences in microbiome composition. STEC-negative cows were associated with abundance elevations in *Bacteroidetes (p<0.001)* with an average of 27 Operational Taxonomical Units (OTU) compared to STEC positive cows with an average of 5 OTUs. These results not only support a previous study done in our lab suggesting microbiome differences due to feed type and highlights the importance that STEC colonization plays in facilitating microbiome composition. Approaches to prevent STEC colonization and shedding by cows can ultimately translate to better human health by minimizing the likelihood of STEC infections.

EXPLORING A COMMUNICATION MODEL OF SHARED DECISION-MAKING WITH SUB-ACUTE REHABILITATION PATIENTS LIVING COGNITIVE IMPAIRMENT
Tyler Smith
Category & Time: Epidemiology & Public Health, Section 1, 2:30 - 3:45 PM
Poster: 208
Mentor(s): Linda Keilman

By the year 2050, over one in five people will be over 65 years old in the United States. The purpose of this exploratory study is to investigate the impact of Shared Decision Makring (SDM) for older adults (aged 65 years and older) and assess if it has a significant relationship with patient demographics and health outcomes. This project aims to combine the data from nursing home residents from Ingham county including demographics and Mini-Cog test for mental impairment. We will also record their preceptions of SDM and how it relates to their medical discharge and health goals. Qualitative assessments and quantitative analyses, through regressions, will be conducted to determine the relationships, if any, between the variables in question. We predict that residents that experience SDM more often will report a higher quality of life. This project would enable communities and researchers to associate SDM with improved health outcomes.

PROVISION OF TRANSPORTATION FOR BETTER HEALTH OUTCOMES FOR OLDER ADULTS
Vanessa Lee
Category & Time: Epidemiology & Public Health, Section 1, 2:30 - 3:45 PM
Poster: 209
Mentor(s): Linda Keilman

The purpose of this study is to investigate the impact of preventive healthcare attainment for older adults (aged 65 years and older) and assess if it has a significant relationship with the presence of transportation services geared specifically towards this population cohort. By the year 2050, over one in five people will be over 65 years old in the United States (US). The lack of available and adequate transportation services poses a challenge for older adults whom require frequent health care appointments. This project aims to combine the data from the 500 Cities dataset and primary data collected from transit agencies operating in the cities included in the 500 cities dataset and assess if there is a significant relationship between the presences transportation services and the attainment of preventive health services for Older Adults. Qualitative assessments and quantitative analyses, through regressions, will be conducted to determine the relationships, if any, between the variables in question. We predict that communities with free or reduced rate transportation services for older adults would have a higher prevalence of older adults that have attained preventive services, compared to areas with no transportation provisions in place. This project would enable communities and researchers to associate transportation infrastructure with health outcomes at a geographic level. The results constructs a more consistent transportation outline geared for older adults in 3 counties around Lansing, MI (Clinton, Eaton, Ingham) leading to a higher prospect of successful aging in-place and promoting an active lifestyle for this population.

STANDARD HP PANELS AND THE IDENTIFICATION OF OFFENDING ANTIGEN - HOW USEFUL ARE THEY?
Guy Giordano
Category & Time: Epidemiology & Public Health, Section 1, 2:30 - 3:45 PM
Poster: 210
Mentor(s): Melissa Millerick May

Hypersensitivity Pneumonitis (HP) is a serious and potentially fatal respiratory disease that is difficult to diagnose. Development of disease is the result of an inhaled exposure to antigen in their environment. At present, the most effective method of treatment is antigen avoidance, and if done so early, a patient has the potential to reverse their disease. If the offending antigen is not identified or able to be avoided, treatment involves the use of immunosuppressant drugs. Chronic exposures may result in fibrosis which can be fatal. Standard HP panels consist of 3-8 antigens out of roughly 300 known to be associated with the disease. If there is a positive response, the source (location) may not be readily identifiable, or may simply be an indicator of prior exposure. This research builds upon an existing study which takes a personalized approach to antigen ID. We will evaluate the use of a standard 8 antigen HP panel for the determination of offending antigen in exposure matched cases and controls and compare results to those of immunoassays utilizing antigen collected from the patient's environment. Outcomes will be used to: 1) determine the appropriateness of use of the standard HP panel for this patient population, 2) identify antigen not previously reported to be associated with HP, and 3) determine the need for development of a novel HP panel possibly by region (Midwest). This work is imperative as improved survival has been reported in patients for which offending antigen has been identified.

THE PREVALENCE OF EATING DISORDER RISK IN A SAMPLE OF MIDWESTERN COLLEGE U.S. ARMY RESERVE TRAINING CORPS CADETS
Jessica Kwalli
Category & Time: Epidemiology & Public Health, Section 1, 2:30 - 3:45 PM
Poster: 211
Mentor(s): Won Song, Elahe Crockett-Torabi

Introduction: Reserve Officer Training Corps (ROTC) Cadets are required to maintain strict weight standards along with the ability to pass the Army Physical Fitness Test (APFT) semi-annually, which have been hypothesized to be associated with increased risk for eating disorders. Only one study has examined eating disorder risk in males and females in US Military Academy (West Point) Cadets and found a prevalence of eating disorder risk of 19% and 2% amongst female and male Cadets, respectfully. Therefore, we determined the prevalence of eating disorder risk in a sample of male and female ROTC Cadets (18-32 y.o.). Methods/Results: A total of 205 ROTC Cadets were asked to complete a series of questionnaires including the Eating Disorder Diagnostic Scale (EDDS). The EDDS is a questionnaire used to assess the symptoms related to eating disorder risk. Previous studies used scores of ?16.5 as the criteria for being at risk for eating disorders. Of the participants with complete data (n=200), 29.8% (n=60) met the criteria for being at risk for eating disorders, with a significant difference between female (27/63, 41.5%) vs. male (34/137, 24.3%) Cadets. Conclusion: These findings indicate that there is a high prevalence of eating disorder risk amongst both male and female ROTC Cadets. Therefore, there is a need to continue to examine the risk for eating disorders among ROTC Cadets. Support: J.K. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

TESTING THE IMPACT OF MOBILE PHONE TEXTING AND PATIENT ACTIVATION PROGRAM ON DIABETIC AND BLOOD PRESSURE CONTROL: THE OFFICE GUIDELINES APPLIED TO PRACTICE (OFFICE-GAP) PROGRAM
Amari Ellsworth
Category & Time: Epidemiology & Public Health, Section 2, 2:30 - 3:45 PM
Poster: 214
Mentor(s): Adesuwa Olomu, Elahe Crockett-Torabi

Patient Activation Interventions (PAI) instill skills and confidence that improve patient engagement and health outcomes. Mobile TeXTing interventions (TXT) have been proposed to activate patients and maintain positive behavior changes. Studies indicate mhealth interventions are not enough, on their own, to improve patient health outcomes. Objective: to determine if combination of PAI (Office-GAP) + TXT improves: 1) patient activation scores, 2) blood pressure (BP) control, and 3) Diabetic control (A1c) more than TXT alone. Hypothesis: Combination of Office-GAP + TXT will improve Patient activation scores, BP and diabetic control more than TXT alone. Method: The Office-GAP/TXT (CareSmarts) intervention is a two-arm pilot study in Internal Medicine Residency clinics. Patients were assigned to Office-GAP + TXT or TXT alone based on whether they attended the Green-team or White-team clinics. Office-GAP

included: 1) Patient activation group visit, 2) Provider training, and 3) Decision support checklist used in real time. TXT intervention included: Sending patients daily messages appropriate to their diagnosis and medications for 14-weeks. We evaluated the impact of the Office-GAP /TXT on patient activation scores, BP and diabetic control. Patient Activation Measure consists of a 10-item scale scored from 0-100. Results: Data collection is currently in progress and will be discussed in detail later. Conclusion: If our data supports the hypothesis, a randomized control trial of the interventions will be conducted to determine the efficacy and cost-effectiveness of the interventions on health outcomes. Support: A.E. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett.

HOW EDUCATION AND RELIGION CORRESPONDS TO THE AMOUNT OF PHYSICAL ACTIVITY PERFORMED BY PREGNANT BLACK WOMEN

Relicious Eboh
Category & Time: Epidemiology & Public Health, Section 2, 2:30 - 3:45 PM
Poster: 215

African American women in the U.S. are more likely to deliver preterm compared with white women. Research has shown that an increase in physical activity may reduce the rate of preterm birth. Social factors, which include education and religion, may be associated with physical activity during pregnancy. We examined the levels of non leisure time physical activity in African American pregnant women in relation to their level of education and religious engagement in a birth cohort study of preterm birth in Black women in Southfield, Michigan (N=1410; 71% response rate) with in person interviews. We focused on "walking for a purpose," not as part of an exercise program, as only a very small proportion of women did any exercise. Physical activity was reported as minutes per week walking that was not part of an exercise program and dichotomized (<30 minutes per day "inactive" (62.9%); >30 minutes "active" (37.1%). Highest self-reported level of education was categorized as: less than high school/high school diploma (16.4%), technical training (11.8%), some college without a degree (58.0%), ?associate's degree (13.7%). Religious engagement was measured as 4 categories of prayer (never, 0.5%; not too often, 6.5%; often, 23.2%; very often, 63.7%). A logistic regression model was used to estimate the effect of prayer frequency and education together on the likelihood of women being physically active. The odds of being physically "active" were 0.60 (0.36, 0.99) times lower for those who prayed "not too often" compared with other prayer frequency groups. The odds of being physically active were 0.59 (95% CI: 0.37-0.95) times lower for those with technical training compared to other educational groups. Our results suggest that social factors could influence physical activity among African American women during their pregnancy.

AT-RISK EATING BEHAVIORS AND BODY IMAGE PERCEPTIONS IN RESERVE OFFICER TRAINING CORPS (ROTC) CADETS AT A MIDWESTERN UNIVERSITY

Allegra Picano
Category & Time: Epidemiology & Public Health, Section 2, 2:30 - 3:45 PM
Poster: 216
Mentor(s): Won Song

Previous research indicates the presence of at-risk eating behaviors and body image concerns in Army ROTC Cadets. Little is known about factors that are associated with at-risk eating behaviors within this population. In an effort to identify potential underlying factors associated with at-risk eating behaviors, we aimed to describe ROTC Cadets' perceptions of their eating behaviors and body image perceptions within the context of ROTC. Qualitative data was collected through one-on-one semi-structured phone interviews between researchers and 18 ROTC Cadets. Interview questions were developed to probe Cadets' eating behaviors and body image perceptions within ROTC. All interviews were recorded, transcribed verbatim, and coded using thematic coding. Preliminary findings indicate that most ROTC Cadets eat 2-3 meals/day consisting of what they consider to be "healthy" foods while avoiding "unhealthy" and "processed" foods. These eating patterns were described to change in preparation for semi-annual ROTC physical fitness and height/weight standards tests, with most Cadets reporting ritualistic eating patterns that involved eating less and/or eating only certain foods in preparation. Most Cadets reported a perceived connection between unhealthy diet and lack of exercise with negative body image. The practice of ritualistic eating patterns by ROTC Cadets in preparation for ROTC standards tests may put ROTC Cadets at increased risk for at-risk eating behaviors. Findings from this research indicate the potential need for nutrition education to support military performance without increasing risk for at-risk eating behaviors and body image concerns in this population.

FOOD INSECURITY, PERCEIVED STRESS, AND WEIGHT STATUS AMONG HEAD START MOTHER-CHILD DYADS

Alyssa Smith
Category & Time: Epidemiology & Public Health, Section 2, 2:30 - 3:45 PM
Poster: 217
Mentor(s): Jiying Ling

Evidence shows that higher stress levels exacerbate the association between food insecurity and children's weight status, but no prior study was found focusing on low-income Head Start families. The purpose of the study was to examine the relationship among food insecurity, perceived stress, and weight status among Head Start mother-child dyads. A cross-sectional, correlational study was conducted. Height and weight were measured. Perceived stress was assessed by the 10-item Perceived Stress Scale, and food insecurity was evaluated using the 18-item U.S. Household Food Security Survey Module. A total of 35 mother-child dyads participated. The average age of children was 56 months old (SD=9.35), and the average age of mothers was 30 years old (SD=5.63). The child sample included 49% female, 23% Hispanic, 60% Black, and 26% White. The mother sample included 17% Hispanic, 54% Black, and 34% White. About 34% of children and 87% of mothers were overweight or obese. Nearly half (49%) of participants were food insecure and 29% were marginally food secure. Household food insecurity status was highly and positively correlated with parental perceived stress (r=.70, p<.01). The negative relationship between household food insecurity and child body mass index z-score (r=-.03) was not significant, even after controlling for parental perceived stress (r=-.14). Overweight and obese mothers reported significantly higher stress level than healthy weight mothers (M=20.78, 19.39 vs. 11.25; p=.028, .045). Interventions focusing on stress management are needed to promote health among low-income Head Start families.

INTEGRATIVE BIOLOGY

IS THERE A CHEMICAL BASIS FOR NEURONAL CO-TRANSMISSION?

Katarzyna Purzycka
Category & Time: Integrative Biology, Section 1, 2:30 - 3:45 PM
Poster: 220
Mentor(s): R Root-Bernstein

Most neurons store and release more than one neurotransmitter. No one knows why some neurotransmitters are costored and co-released in particular pairs while most possible pairs are not observed. We propose that co-stored and co-released neurotransmitters chemically bind to each other, while pairs of neurotransmitters that are not found together do not bind to each other. The basis of this hypothesis is a broader observation made by Root-Bernstein and Dillon that molecules that bind to each other generally alter each other's physiological activity and, conversely, compounds that alter each other's physiological activity, generally bind to each other (Root-Bernstein and Dillon, 2007). Ultraviolet spectroscopy is used to obtain the absorbance spectra of neurotransmitters at varying concentrations. According to Beer's law, if there is no chemical interaction between chemicals, when they are added to each other, their combined spectrum will be an exact sum of their individual spectra. Differences from the predicted sum that vary by concentration can be used to determine chemical binding curves of neurotransmitters. The neurotransmitters to be studied in all of their varied combinations are: acetylcholine, ascorbate, dopamine, epinephrine, GABA, glutamate, glycine, histamine, melatonin, norepinephrine, octopamine, serotonin, adrenocorticotropic hormone, crustacean erythrophore concentrating hormone, endomorphin, met-enkephalin, neurotensin, substance P, thyrotropin releasing hormone, vasoactive intestinal polypeptide. Data from our experiments will be provided and our hypothesis tested by comparing our results to literature reports of cotransmission.

DIGIT RATIOS AND ANAL SEX ROLE: EVIDENCE THAT PRENATAL ANDROGENS INFLUENCE THE SEXUAL ORIENTATION OF SUBGROUPS OF GAY MEN

Victor Dirita
Category & Time: Integrative Biology, Section 1, 2:30 - 3:45 PM
Poster: 221
Mentor(s): Ashlyn Swift Gallant

Prenatal androgen exposure is associated with the ratio of the second digit to the fourth digit (2D:4D) in humans: lower ratios indicate higher prenatal androgen exposure. Prenatal androgens have been suggested to influence sexual orientation in humans, but studies have inconsistently reported an associated of 2D:4D with male sexual orientation. Some studies find that gay men exhibit higher (more female-typical) ratios, while others report that gay males show lower (more male-typical) ratios. Still others find no significant difference between the two groups at all. These

inconsistent findings suggest that some gay men may be exposed to high levels of prenatal androgens, while others may be exposed to lower androgens. Since prenatal markers of androgens including 2D:4D are associated with gender expression, and anal sex role groups differ in gender nonconformity, we hypothesized that prenatal androgens may differ among anal sex role groups. To test this hypothesis, we recruited a pool of 124 gay men, from both Canada and USA. We collected sexual orientation, anal sex role, gender non-conformity (also related to the 2D:4D ratio), and 2D:4D data. We found that gay men with an insertive (top) anal sex role were more gender conforming and exhibited more male-typical 2D:4D. Gay men with a receptive (bottom) anal sex role exhibited greater gender nonconformity as well as higher 2D:4D ratios. Taken together, these findings suggest that gay men delineated by anal sex role differ in the underlying biological processes that led to their same-sex sexual orientation.

ASSESSING PHOTORECEPTOR-DEPENDENT CARBON ASSIMILATION OF THE CYANOBACTERIUM FREMYELLA DIPLOSIPHON

Kiara Rodriguez
Category & Time: Integrative Biology, Section 1, 2:30 - 3:45 PM
Poster: 222
Mentor(s): Beronda Montgomery, Brandon Rohnke

Cyanobacteria are oxygenic photoautotrophs central to global carbon fixation. In part, this is due to a carbon concentrating mechanism (CCM) inside bacterial microcompartments called carboxysomes that concentrates carbon dioxide (CO_2) around RubisCO, an enzyme which catalyzes the first step of the Calvin-Benson cycle. Recent studies linked activity of photoreceptor RcaE to regulating carboxysome morphology, showing that its absence led to a reduction of carboxysome size, while increasing carboxysome abundance in cells. However, the functional impact of these changes on carbon fixation and the rate of photosynthesis has not been explored. RcaE controls a complementary chromatic acclimation response during which photosynthetic efficiency is tuned to the ratio of red light (RL) and green light (GL). To explore the impact of RcaE regulation of carboxysomes on carbon assimilation in the cyanobacterium *Fremyella diplosiphon*, gas exchange and inorganic carbon assimilation measurements are being conducted in dynamic environments. In the present study, an evaluation of gas exchange behavior in *F. diplosiphon* utilizing both wild type and RcaE-deficient mutant (Δ*rcaE*) strains under GL and RL is being conducted. Carbon assimilation was measured as a response to changing CO_2 concentration or light intensity to generate response curves, establish general behavior of photosynthetic rates, and test which regions of carbon response curves are specifically responsive to light cues and carboxysome morphology. The Δ*rcaE* mutant strain exhibits a deficiency in carbon uptake and/or assimilation only under GL conditions, and results indicate that light availability controls a greater region of carbon response curves than comparisons to plants would suggest.

A LOOK AT THE HIPPOCAMPUS IN CONTEXT-INDUCED REINSTATEMENT OF DRUG-SEEKING BEHAVIOR; A RODENT MODEL FOR DRUG RELAPSE

André Herrera Charpentier
Category & Time: Integrative Biology, Section 1, 2:30 - 3:45 PM
Poster: 223
Mentor(s): Amy Arguello

Drug-associated environments have the ability to trigger relapse, which can impede subsequent rehabilitation. To create better treatment methods, it is important to understand the neurobiological mechanisms by which these cocaine-context memories potentiate future relapse. By using a rodent model of drug relapse, previous studies have shown that extracellular signal-related kinase (ERK) within the basolateral amygdala contributes to the reconsolidation of cocaine-context memories that promote subsequent drug-seeking behavior. The role of ERK within the dorsal and ventral hippocampus (DH and VH) in this phenomenon is unclear; therefore, we aim to determine whether ERK protein levels within the DH or VH are altered following re-exposure to a previously cocaine-paired context. Male Sprague-Dawley rats underwent jugular catheterization surgery, followed by a recovery period. Rats were then placed in a distinctive context and trained to press a lever to administer a cocaine infusion (self-administration (SA) training). Next, rats underwent extinction training in a separate and distinct context in which lever presses resulted in no infusions. After extinction, rats were placed back into the cocaine-paired context for a 15-minute memory-reactivation (MR) session. Rats were then sacrificed, brains extracted and tissue punches obtained. We aim to quantify protein levels of ERK via western blotting between MR and no MR groups. The DH plays an important role in maintaining contextual memories that potentiate drug relapse and the VH in motivational and emotional behavior. We expect that ERK will be increased in both hippocampal regions, following cocaine-context memory retrieval.

THE EFFECT OF MEMORY REACTIVATION ON NEUROGENESIS
Isabella Salinas
Category & Time: Integrative Biology, Section 1, 2:30 - 3:45 PM
Poster: 224
Mentor(s): Amy Arguello

Relapse remains a critical problem in the successful treatment of chronic cocaine-use disorders. Exposure to drug-associated environments can trigger future relapses. Previous studies investigated the role of specific signaling molecules in the reconsolidation of drug memories, by utilizing a rodent model of relapse. The role of plasticity-related molecules in this phenomenon is underexplored; therefore, we aim to determine whether doublecortin (DCX) within the dorsal hippocampus (DH) and ventral hippocampus (VH) is altered after retrieval of cocaine-context memories. Male Sprague Dawley rats received jugular catheterization surgery, followed by a recovery period. During the self-administration phase (SA), rats were trained to press a lever paired with cocaine infusions in a specific environment. After SA, rats were placed in a second, distinct context where lever pressing was extinguished (i.e. lever presses were not reinforced). Following extinction, rats were exposed to the initial cocaine-paired context for 15 minutes (i.e. memory-reactivation (MR-session)). Tissue punches from the VH or DH were collected and DCX protein levels examined via western blotting. Previous results found that DCX protein levels were elevated in the DH in MR versus no-MR controls. We aim to examine whether DCX levels within the VH are altered after retrieval of cocaine-associated contextual memories. Given that DCX is a protein that is expressed by adult-generated neurons within the hippocampus, these results would provide a foundation to explore if 1) DCX is involved in reconsolidation processes that contribute to strengthening maladaptive drug memories and 2) adult neurogenesis may be involved in the reconsolidation process.

THE EVOLUTION OF ELECTRIC ORGANS IN MALAPTERURUS ELECTRICUS DUE TO THE NEO-FUNCTIONALIZATION OF SCN4AB
Hope Healey
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 228
Mentor(s): Jason Gallant

Electric fish are a study system for neurobiology and evolution, and have evolved electric organs. Although there is no electric common ancestor of all electric fish, these organs all rely on similar proteins, sodium ion channel proteins, to produce electric signals. Due to multiple rounds of whole genome duplication, teleost fish have two copies of the sodium channel gene scn4a. In two independent lineages of electric fish, gymnotiforms and mormyrids, electric organs evolved from skeletal muscle. In both families, scn4aa accumulated mutations and experienced a change in expression location from skeletal muscle to the electric organ. Unlike scn4aa, scn4ab did not acquire mutations that altered the expression position or function of the protein. The relationship between scn4ab and scn4aa expression and organ type has been well documented in gymnotiforms and mormyrids; however, it is unknown whether these genes follow the same pattern in other lineages of teleost electric fish such as in the electric catfish (Malapterurus electricus). To show whether scn4aa and scn4ab gene expression patterns in M. electricus matches that of gymnotiforms and mormyrids, these genes have been identified in M. electricus and their expression will be analyzed through qPCR.Tests of selection will also be completed to determine whether either gene is under positive selection in M. electricus. Through examining the relative expression of each gene in the electric organ and skeletal muscle as well as following the evolution of scn4aa and scn4ab sequences, the genetic basis for the electric organ in M. electricus will be elucidated.

DENDRITIC SPINE DEVELOPMENT IN THE NEOCORTEX OF A MOUSE MODEL OF FRAGILE X SYNDROME
Mia Railing
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 229
Mentor(s): Charles Cox, Joseph Beatty

Fragile X Syndrome (FXS) is a neurodevelopmental disorder caused by a silencing mutation in the Fmr1 gene encoding for the RNA-binding protein FMRP, which is highly expressed in neurons. Absence of FMRP at neuronal synapses leads to increased synaptic excitability and hinders synapse development. These alterations are attributed to the FXS phenotypes observed in humans and animal models including: hyperactivity, learning deficits, repetitive behavior, and epilepsy. In the neocortex a majority of excitatory synapses occur at dendritic spines, and studies have proposed a physiological link between the FXS dendritic spine phenotype and hypersensitivity to somatic and visual stimuli. However, recent studies using the Fmr1 knockout (KO) model have not found a consistent trend in spine density and morphology, possibly due to varying methods of imaging and analysis. We generated datasets for two critical time

points for wildtype (WT) and Fmr1 KO mice; one during development, postnatal day 30 (P30), and one at adulthood (P90+). Using two-photon laser imaging of layer 5 pyramidal neurons in visual and somatosensory cortex, we analyzed apical and basal dendrites for changes in spine density, length, and morphology. Our results show an increase in spine density and a decrease in spine length for L5 pyramidal neurons in somatosensory cortex in the Fmr1 KO condition at P30, with no change observed in L5 neurons in visual cortex. With this result we provide initial morphological evidence of the Fmr1 KO spine phenotype that will be further explored at the P90 time point in our study.

EFFECTS OF LUNG VOLUME ON RESPIRATORY SINUS ARRHYTHMIA
Kaylie Chiles, Nicholas Garnett
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 230
Mentor(s): Erica Wehrwein

Respiratory Sinus Arrhythmia (RSA) is the variability in heart rate that is in synchrony with respiration. Activation of stretch receptors in the lungs increases heart rate via inhibition of parasympathetic pathways (known as the Hering-Breuer Reflex). When comparing standing, sitting, prone, and supine positions, variability of RSA was expected to be the greatest in the supine position and least in the prone position. Young healthy college students (ages 20-26, 3F/5M) performed normal quiet breathing for two minutes in each posture. Following two minutes of quiet breathing, subjects performed forced inspiration and forced expiration. Throughout the experiment, heart rate was measured using a pulse transducer and respiratory volumes were measured using a spirometer. Average tidal volume for females in each posture was significantly lower than the average tidal volume for males in each posture (0.77 +/- 0.04 L vs. 1.04 +/- 0.06 L, $p<0.10$). In males, standing and prone tidal volumes were both significantly higher than supine tidal volume ($p<0.05$). No significant differences were found in RSA between males, females, or across the two groups ($p>0.05$). In summary, heart rate does not change significantly across postures because tidal volume does not sufficiently activate stretch receptors to elicit significant vagal inhibition. Anatomical variations due to sexual dimorphism account for differences in lung volumes between males and females. Maintenance of RSA despite changes in posture, lung volume, and blood pressure occurs as a result of minimal stretch receptor activation and limited inhibition of vagal regulation of heart rate.

DENDRITIC SPINE ALTERATIONS LEAD TO HYPEREXCITABILITY OF STRIATAL SPINY PROJECTION NEURONS IN THE MOUSE MODEL OF FRAGILE X SYNDROME
Allison Nieto
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 231
Mentor(s): Joseph Beatty

Fragile X syndrome (FXS) is the most common form of inherited intellectual disability and the leading genetic cause of autism spectrum disorder. Symptoms include hyperactivity, social phobia, impaired cognition, and repetitive/compulsive behaviors. FXS is caused by a repeating CGG mutation in the fragile X mental retardation 1 (*FMR1*) gene leading to a decrease in fragile X mental retardation protein (FMRP). FMRP is highly expressed in neurons, especially in dendritic spines, the primary site of excitatory synaptic connections. Neocortical neurons from FXS patients and *Fmr1*knock-out (KO) mice have an increased density of abnormally elongated dendritic spines that lead to alterations in synaptic transmission. The basal ganglia are implicated in voluntary motor control/learning and their dysfunction has been linked to repetitive/compulsive behaviors; however, few studies have investigated the spine morphology of striatal spiny projection (SP) neurons in FXS. In this study we performed two-photon laser scanning imaging of fluorescently labeled SP neurons combined with whole-cell intracellular recordings from WT and *Fmr1*KO mice. *Fmr1*KO mice displayed a reduced population frequency of mature, mushroom-type spines on SP neurons compared to WT. In addition, *Fmr1*KO mice had a lower density of total spine and mushroom-type spines on SP neurons compared to WT. Counterintuitively, *Fmr1*KO mice exhibited an increased frequency of both spontaneous and miniature excitatory post-synaptic currents compared to WT. This suggests that while *Fmr1*KO mice have less excitatory synaptic connections than WT mice, these connections may be stronger overall, leading to a net increase in neuronal excitability.

ENTERIC NEURAL REGULATION OF GLUCOSE TRANSPORT IN PIGS EXPOSED TO EARLY LIFE ADVERSITY
Sarangelica Alamo Ortiz
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 232
Mentor(s): Adam Moeser, Yihang Li

Early life adversity (ELA) is a major risk factor for later life susceptibility to many gastrointestinal (GI) disorders and metabolic disease such as obesity and Type 2 diabetes. The mechanistic link between ELA and later life disease risk is poorly understood. Our previous in pigs showed that ELA induces long-term alterations in intestinal epithelial glucose transport functions, characterized by a decrease in sodium glucose linked transporter 1 (SGLT1) function and upregulation of the facilitated glucose transporters GLUT2. Further, we showed that the reduced SGLT1 function was in part mediated by the enteric nervous system via cholinergic- and adrenergic -dependent pathways. The objective of the current study is to investigate the role of the ENS in modulating ELA-induced changes in GLUT2 expression and function in a porcine early weaning model of ELA. Ileal mucosa will be harvested from 11 week old early weaned (EWS) and late weaned (LW; controls) female pigs to investigate the impact of ELA and ENS activity on GLUT2-mediated glucose absorption in Ussing chambers and expression via Western blotting. In addition, measurements of fasted-state blood glucose levels will be measured in EWS and LW pigs.

UNCOVERING THE REGULATION OF PROGENITOR CELLS IN THE ZEBRAFISH ENTERIC NERVOUS SYSTEM
Josue Franco
Category & Time: Integrative Biology, Section 2, 2:30 - 3:45 PM
Poster: 233
Mentor(s): Julia Ganz, Ingo Braasch

The enteric nervous system (ENS) is the largest division of the peripheral nervous system. It innervates the gut and regulates all gut functions. While we know what functions the ENS carries out, there is still a significant gap in knowledge as to how the development of the ENS is regulated. During development, ENS progenitor cells differentiate into neuronal and glial cells, but which factors determine the cellular fate of each progenitor cell remains unknown. Improper ENS development can lead to ENS diseases, such as Hirschsprung's disease, a congenital disease characterized by lack of ENS neurons in terminal regions of the gut. Our research question is 'How are differentiation processes in the ENS regulated?'. Our hypothesis is that a set of candidate genes regulate ENS progenitor cell differentiation into neurons. To test this hypothesis, we employ CRISPR/Cas9 genome editing technology to create deleterious mutations in a specific region of each candidate gene using zebrafish as a model organism. Most gene functions are conserved between zebrafish and humans, thus what we learn from zebrafish will be directly applicable to the mammalian ENS. CRISPR/Cas9 components are injected into one-cell stage embryos. At five days post fertilization, number of ENS neurons and neuronal subtypes will be compared between injected larvae and uninjected controls. Changes in ENS neuron number will indicate that the tested gene may have an effect on progenitor cell differentiation. Our work will contribute to a better understanding of how ENS differentiation is regulated during development.

GENE EXPRESSION PATTERNS OF GLUTAMATE RECEPTORS IN ZEBRAFISH AND SPOTTED GAR
Fiona Brewer, Madison Kraus
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 236
Mentor(s): Ingo Braasch, Julia Ganz

Teleost fish have undergone a whole genome duplication (WGD). After WGD, gene duplicates are either lost, subdivide their functions (subfunctionalization) or gain new functions (neofunctionalization). In teleosts, the genes for metabotropic glutamate receptors (GRMs) have one of the highest duplicate retention rates following a WGD. This project tests the hypothesis that GRMs have undergone sub-and/or neofunctionalization with regard to their expression patterns. To test this, we compare gene expression patterns of eight GRMs in the brain of the teleost zebrafish and the non-teleost spotted gar using RNA in situ hybridization. Gar diverged before the teleost-specific WGD, thus serving as a proxy to the ancestral, pre-WGD condition. This comparison can provide insight to possible alterations of function in teleost GRMs. First, we generated RNA probes for the eight GRMs in gar. We designed primers for the coding sequence of each gar GRM and amplified them by PCR. The PCR products were cloned in plasmids and sent to Sanger sequencing for sequence verification and comparison to the annotation in the gar genome. Future work for the project will include generating RNA probes for in situ hybridization on varying developmental stages of gar brains and comparing them to the zebrafish expression patterns. Visualizing GRM expression in gar brains and comparing them to zebrafish may point

to differences in location and function between teleost fish and gar. This could help answer why GRMs were retained at such high rates, and whether the WGD of the teleost lineage has led to changes in their functions.

THE RELATIONSHIP BETWEEN THE MOTIVATIONAL DRIVES OF FOOD-SEEKING AND SOCIAL INTERACTION IN ADOLESCENT FEMALE AND MALE RATS

Natasha Méndez-Albelo
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 237
Mentor(s): Alexa Veenema, Christina Reppucci

The innate motivation to seek food is crucial for all organisms to survive. However, survival also relies on the development and display of appropriate social interactions. Social interaction can be particularly crucial during adolescence because it is critical for the development of certain cognitive, motor coordination, and social skills. However, the ways that the internal motivational drives of food-seeking and social interaction interact with each other remains unclear. In this study, we aimed to understand if the drives for food-seeking and social interaction compete with each other using a three-chamber preference test. During this test, adolescent experimental female and male rats were given the choice to investigate food (standard laboratory chow) or a rat (matched for sex and age) located in corrals on opposite ends of the apparatus. Preference was determined by calculating the relative amount of time the experimental rats spent interacting with each stimulus (i.e., food and rat). We were interested in how preference would change when differing the strength of these motivational drives (seeking food or seeking social contact). To investigate this, rats were tested under two feeding conditions (food-deprived vs. sated) and two social conditions (isolated vs. pair housed). In the future, we will test if pharmacologically inactivating the ventral tegmental area, which is an important region of the brain for motivation and reward, will impair the expression of food seeking, social contact seeking, or both of these motivational drives.

CHANGES IN THE SEROTONERGIC FIBER DENSITY IN THE SOMATOSENSORY CORTEX ACROSS REPRODUCTIVE STATES IN FEMALE RATS

Yamilka Rios-Guadalupe
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 238

Motherhood involves many changes in the brain that are necessary for successful caregiving. The somatosensory cortex of lactating female rats undergoes neuroplastic changes in response to stimulation of the dams ventrum by pups, which may maximize her sensitivity during nursing bouts. The neurotransmitter, serotonin, is known to be generally involved in neuroplasticity but it is unknown if serotonin in the somatosensory cortex changes across female reproduction and could contribute to its plasticity in mothers. To determine whether serotonin might have a role in somatosensory plasticity we will be conducting immunohistochemistry for serotonin and analyzing serotonin immunoreactive density in the somatosensory cortex across reproductive state in female rats. Specifically, serotonergic fiber density will be analyzed across 5 reproductive states in female rats: diestrus virgins, pregnancy day 10, within three hours of parturition, postpartum day 7 and postpartum day 18. We predict that serotonergic fiber density in the somatosensory cortex will vary across females in different reproductive states, with lactating rats having a higher density of serotonin fibers than non-lactating rats. This higher serotonin fiber density would suggest a role for this neurotransmitter in the neuroplastic changes found in the somatosensory cortex during lactation, with implications for changes in how mothers sense tactile inputs from their young.

PLAY PARTNERS AND RANKING IN SPOTTED HYENAS (CROCUTA CROCUTA)

Candice Rivers
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 239
Mentor(s): Eli Strauss, Kay Holekamp, Tracy Montgomery

What determines play partner preferences among spotted hyena cubs (Crocuta crocuta)? Previous research shows that cubs who are more related and of similar age are more likely to play together, but it remains unclear if social rank influences play partner choice. In this species, cubs are still acquiring their rank during the juvenile period, so social rank changes throughout development. Here we simultaneously track the play preferences and social ranks of developing cubs to ask whether rank is correlated with play partner choice. Rank is measured as the outcome of dyadic aggressions and play partner preferences are measured as the frequency of scans in which a dyad is playing together. This project will give us a better understanding as to why and how cubs interact with one another.

ROLE OF THE VENTRAL TEGMENTAL AREA IN ENERGY BALANCE
Camille Domenech Barreto
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 240
Mentor(s): Gina Leinninger

Obesity is a world-wide public health crisis. Diet and exercise are the most widely prescribed treatments for the disease, but concomitantly increase appetitive drive that often leads individuals to overeat and regain weight. Thus, strategies to support sustained weight loss are sorely needed to treat obesity. The Ventral Tegmental Area (VTA) has been implicated in the pathogenesis and potential treatment of obesity and may be a useful target for treatment. In particular, the neuropeptide neurotensin (Nts) acts in the VTA to promote loss behaviors during high-appetitive drive. The goal is to understand how VTA neurons modulate weight loss behaviors and which VTA neurons could contribute to Nts-mediated weight loss. To understand how VTA neurons modulate behavior and energy balance we are using Designer Receptors Exclusively Activated by Designer brands Drugs (DREADDs) to activate VTA neurons in mice and studying their behavior and body weight. Also, we are defining which VTA cells express Nts receptor-1 (NtsR1) and -2 (NtsR2) that could contribute to Nts-mediated weight loss. We are thus studying NtsR1Cre; GFP and NtsR2Cre; GFP mice to determine which VTA cell types express each receptor isoform. Since these genetic mouse models identify any NtsR1/2-expressing cell, regardless of the amount of receptor expression, we will also directly assess protein expression of the NtsR1 and NtsR2 via antibody-mediated immunofluorescence. These data will direct future investigation of how NtsR1 and NtsR2-expressing cells contribute to VTA-mediated energy balance, which may reveal novel strategies to treat obesity.

A CASE STUDY ON SPOTTED HYENA (CROCUTA CROCUTA) LINEAGE AND PATERNITY
Lila Afifi
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 241
Mentor(s): Kay Holekamp

Spotted hyenas (*Crocuta crocuta*) live in complex, matriarchal societies called clans. Maternity can be determined based on nursing behavior. However, genetic methods are necessary to determine paternity and to track the overall relatedness within a clan. Relatedness has important implications in behaviors such as cooperation and nepotism. Here, we examined the role of paternity within a single matriline over time. Our first hypothesis was that higher ranking females will select higher ranking males and that lower ranking females will select lower ranking males. Our second hypothesis was that once a female selects a mate, the female will repeatedly mate with the same male over the course of his tenure. As a case study, we focused on one prolific female from the Mara Hyena Project's long-term study clan in southwestern Kenya. DNA was extracted from fecal and blood samples.Twelve microsatellite loci were used to assign paternity with the assistance of the program, Cervus. Our statistical analyses will examine the effects of rank and male tenure on the continuity of paternity within a single matriline. The findings will lay the foundation for more comprehensive paternity analyses and contribute to deepening out understanding of the effects of relatedness on behavior.

IS PAIN ASSOCIATED WITH NERVE INFLAMMATION IN GUILLAIN-BARRE SYNDROME?
Joe Faryean
Category & Time: Integrative Biology, Section 3, 2:30 - 3:45 PM
Poster: 242
Mentor(s): Linda Mansfield

Guillain Barré Syndrome (GBS) is the leading cause of acute paralysis in the U.S. This illness is characterized by ascending limb paralysis. NOD CD-86-/- mice have been found to develop Spontaneous Autoimmune Peripheral Polyneuropathy (SAPP) after 20 weeks of age. Previous work determined that SAPP closely mirrors the AIDP form of GBS and that these inbred mice with SAPP can serve as a good model for the study of GBS. Mice that developed SAPP had increased inflammation in their sciatic nerves and dorsal root ganglia. These mice also showed phenotypic signs of pain according to the Mouse Grimace Scale (MGS). We hypothesize that NOD CD-86-/- mice that displayed signs of pain will have increased inflammation in their peripheral nerves compared to the control groups. To test our hypothesis, we had two groups of mice: NOD WT and NOD CD-86-/-. NOD WT served as the control group and the NOD CD-86-/- served as our experimental group. The NOD WT and NOD CD-86-/- mice were put through the open field test and their performance recorded on a camcorder for two to three minutes. These videos were analyzed using the MGS to determine pain levels. After the mice were humanely euthanized, they were necropsied and their brachial plexus, dorsal root ganglion, and sciatic nerve were dissected, fixed and embedded en bloc in paraffin. Blocks were sectioned and

stained with anti-CD3 and anti-F4/80 antibodies to detect T cells and macrophages, respectively. Thereafter, nerve sections were analyzed using morphometry to determine levels of inflammation. We found increase infiltration of t-lymphocytes and macrophages in the peripheral nerves of NOD CD-86-/- mice when compared to the NOD WT mice. Preliminary results of the study indicate no correlation between pain phenotypes and increased inflammation in NOD CD-86-/- mice. This could be the result of damage to the sensory nerves due to immune-mediated attacks.

MECHANICAL, ENVIRONMENTAL & CIVIL ENGINEERING

SALVAGED WOOD PROCESSING: A HEURISTIC DESIGN FRAMEWORK

Horatio Hampton

Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 245
Mentor(s): George Berghorn

Domicology is the study of building life cycles from a standpoint of sustainability. Currently, many areas face a blight epidemic: residential buildings at the end of their life cycles are abandoned, demolished, and the material is wasted. Detroit, for example, currently has upward of 70,000 blighted homes slated for demolition. In this paper, we seek to develop a heuristic framework for an automated approach to the removal of foreign objects from deconstructed lumber. Deconstructing a home costs on average $14.35 per square foot, compared to $11.25 per square foot for demolition. A large portion of this price-gap is due to the time needed to manually remove foreign objects from the lumber. A review of relevant literature highlights time, cost, and a prevalent culture of demolition as the determining factors of why deconstruction is not a widespread practice. By addressing the time and cost elements, there will be fewer barriers to creating a culture of deconstruction. The heuristic model will be developed using elements of set theory to classify foreign object configuration, structured and unstructured interviews with companies and individuals involved in deconstruction, and experiential evidence in order to understand and model the human decision-making process for a machine. To test the heuristic, we plan to program the framework into Scratch or a similar program, and simulate deconstructed lumber given the variables identified during development. Our expected results are that the model will be able to correctly classify and sort simulated lumber based on its contaminants, foreign objects, and predicted uses.

NATURAL COAGULANTS DERIVED FROM MORINGA OLEIFERA: PHYSICOCHEMICAL PROPERTIES AND APPLICATIONS IN WATER TREATMENT

Borguinin Gonety, Akshay Murali, Daniel Thomas

Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 246
Mentor(s): Volodymyr Tarabara

Coagulation is one of the main unit processes used in water treatment worldwide. Although relatively inexpensive, commercially available coagulants such as $Al_2(SO_4)_3$ and $FeCl_3$ are still not affordable in many resource-constrained settings. Natural coagulants derived from locally available plants can be cost-effective, less-toxic alternatives to inorganic salts. Coagulants derived from the seeds of the drumstick tree, *Moringa oleifera* (*M. oleifera*), have been shown to be a promising natural coagulant. Several challenges, however, limit the use of natural coagulants. Firstly, their coagulation mechanisms are poorly understood. Despite a number of studies on the subject, the mechanisms underlying the coagulating effect of *M. oleifera* remains a point of debate. Secondly, there are practical concerns, including increases in the organic content and salinity of the treated water. The present project focuses on elucidating mechanisms of coagulation by *M. oleifera* and designing practical guidelines for a cost-effective and safe application of this coagulant. The efficiency of the extraction procedure over a range of operational parameters have been evaluated in a series of jar tests with model kaolin-in-water suspensions. Based on experimental data collected so far, the coagulant was shown to be the most effective using 0.2 M NaCl as the extractant, giving 96.8% ± 1.3% removal of turbidity at 10 g/L *M. oleifera* dosage. The current work focuses on quantifying the amount of organic matter in water treated using *M. oleifera* derived coagulants. These analyses will help expand applications of these coagulants to include a broader range of source waters.

UTILIZING SPHERICAL HARMONICS AND 3D IMAGING TO CHARACTERIZE AGGREGATE MORPHOLOGY

Anne Heidelberg

Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 247
Mentor(s): Michele Lanotte, Muhammed Kutay

Shape, angularity, and surface texture are important aggregate characteristics that have a significant impact on the long-term performance of asphalt pavements. Flaky aggregates and rounded aggregates can accelerate the deterioration of asphalt pavements during their service life. Currently, there are only a few standards regulating the physical characteristics of aggregates used in pavement. These standards rely on manual, time consuming, and often subjective methods of measurements. In the last two decades, engineers have been trying to develop digital image analysis techniques to make aggregate characterization faster and more indicative of field performance. A few imaging systems have been developed to generate accurate 2D or 3D models of aggregates from which shape, angularity, and surface texture indices can be measured. However, the machinery required for these methods is costly. This research study focused on developing a methodology to measure 3D aggregate shape and angularity indices using a smartphone camera and spherical harmonics. The surface micro-texture index was not explored here due to limitations in smartphone camera resolution. The spherical harmonics fit sometimes has minor waves on the surface of the aggregate which would make surface texture difficult to measure, though it does not affect the overall shape and angularity. If spherical harmonics can be shown to more accurately describe aggregate shape and angularity, then it may be possible to link these spherical harmonic values to specific aggregate shape and angularity characteristics, which would in turn lead to better pavement performance in the field.

AN IN-DEPTH ANALYSIS OF THE MECHANISMS INVOLVED IN RUBENS? TUBE AND HYBRID ROCKET MOTOR DEMONSTRATIONS

Brendan McLean

Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 248
Mentor(s): Patton Allison

Being able to demonstrate physical phenomena that applies to technologies in use today is critical to inspiring the next generation of innovators. The use of specialized equipment to showcase a specific phenomenon allows experts in a field to reach vast audiences, further developing interest in a topic. Within the field of combustion science, the means to emphasize the importance of acoustics and visualize propulsion provide demonstrations that are both educational and entertaining. The Rubens' Tube and the visually accessible acrylic hybrid rocket motor are excellent demonstrations that highlight acoustics and propulsion visualization, respectively. The Rubens' Tube, developed by Heinrich Rubens', allows general audiences to visualize the pressure fluctuations and wavelengths that are characteristic of standing waves by representing them in flames. The varying flame height of flammable gas escaping the tube represents the local pressure fluctuation, and the wavelength can be visually inspected with the distance between flame crests. The acrylic hybrid rocket motor allows general audiences to literally see how a hybrid rocket motor operates by using a clear fuel material. This provides an in depth look about the burn profile as well as the entertainment value of watching the reaction as it happens. By studying these two demonstrations and the physical phenomena they emphasize, larger audiences can be educated about the roles those phenomena play in more advanced engineering applications.

APPLICATION OF A MOTION-CONTROLLED POSITIONING SYSTEM TOWARDS MOLECULAR TAGGING VELOCIMETRY OBSERVATION

Kalvin Monroe

Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 249
Mentor(s): Ahmed Naguib, David Olson

Molecular tagging velocimetry (MTV) is a noninvasive whole field optical technique used in the measurement of fluid flows. In aerodynamic studies the flow around and near the surface of an airfoil is of particular interest. When an airfoil remains close to a fixed location, such as being stationary or oscillating around a point, a stationary camera is sufficient to capture the flow field of interest. However, measurements involving more dynamic systems where the airfoil moves larger than a single field of view become problematic. A system in which the camera has the ability to track the object of interest would be of significant value as it would allow for extended analysis of dynamic systems through programmable motion. In this work, a multi-axis motion controller, stepper motors, and linear positioners are combined and integrated with the existing equipment to create a 3-axis camera positioning system. By programming and synchronizing the

motion of the camera with the moving airfoil, uninterrupted data from the reference frame of the moving airfoil can be collected. This motorized system offers many advantages to the current hand-driven camera carriage. Its discrete command over camera placement and ease of use aims to increase the data collection ability of the water tunnel, decrease experiment setup time, and provide a more accurate system of camera positioning.

NON-LINEAR MECHANICAL BEHAVIOR OF HUMAN THIGH FINITE ELEMENT MODEL INFORMED BY IN VIVO EXPERIMENTAL DATA

Eli Broemer
Category & Time: Mechanical, Environmental & Civil Engineering, Section 1, 2:30 - 3:45 PM
Poster: 250
Mentor(s): Sara Roccabianca

Individuals bound to hospital beds and wheelchairs are likely to suffer from pressure ulcers in their posterior region. This health concern is due to constant pressure within soft tissues over an extended time period. Surface pressure measurement is the only indicator in clinical practice for this issue. However, models showing the stress distribution within the soft tissues can improve the prediction and diagnosis in the clinical setting. Computational methods are widely used to better understand the formation mechanism of pressure ulcers. Previous research methods on this topic did not include the non-linear characteristic of soft tissues, which may give inaccurate stress-strain results. In this research, a finite element model is developed to accurately show the non-linear behavior of soft tissues. The FE model includes the human tissues (i.e. fat, muscle, and bone) that compose the thigh and buttock regions. Precise geometry for these sections is obtained from 2D cryosection images provided by the Visible Human Project. Experimental compression force deflection data is collected at three different locations (i.e. proximal, middle, and distal locations) on the thigh. To address the non-linear behavior of soft tissue in the FE model, the experimental data informs an optimization process to search for the best fit material parameter. This is the first analytical model of the thigh and buttock which addresses the non-linear mechanical response of the biomaterials. The optimization and model approach in this research is useful to others interested in accurate soft tissue modeling.

SWELLING OF THE PORCINE URINARY BLADDER: EFFECT OF LOCATION AND OSMOLARITY

Brett Johnson
Category & Time: Mechanical, Environmental & Civil Engineering, Section 2, 2:30 - 3:45 PM
Poster: 253
Mentor(s): Sara Roccabianca

Urinary bladder (UB) tissue is subject to expansion and contraction as the bladder fills and empties. Healthy tissue is able to perform this cycle thousands of times without issue, however there are several diseases and disabilities which cause a change in the microstructure of the UB wall, leading it to behave pathologically. This research aims to create a model of the neurogenic UB in order to predict and prevent its pathological remodeling. Porcine bladder tissue was used in our testing as it is very similar to human bladder tissue. Our experimentation focuses on finding patterns regarding tissue swelling and stress measurements among the five regions of a porcine bladder. Uniaxial stress relaxation tests were performed on tissue samples while being soaked in solutions mimicking the internal conditions of the body. During a test, the sample is subject to constant levels of strain for set time intervals. Two independent variables were analyzed throughout these tests: specific location of the sample from the UB and osmolarity of the solution. We also investigated the swelling patterns of the different regions of the bladder by comparing masses and volumes before and after soaking in modified Krebs solutions at various osmolarities. For both testing procedures, statistically significant differences in swelling were found between various locations and osmolarities.

THE ROLE OF ISCHEMIA IN THE OPTIMIZATION OF CARDIAC RESYNCHRONIZATION THERAPY

Sreekar Malempati
Category & Time: Mechanical, Environmental & Civil Engineering, Section 2, 2:30 - 3:45 PM
Poster: 254
Mentor(s): Jayavel Arumugam, Lik-Chuan Lee

Cardiac resynchronization therapy (CRT) is used in order to restore the heart's rhythm and synchronize the left and right heart chambers in diseases. Approximately 30% of CRT recipients, however, are non-responsive to treatment. We hypothesize that the efficacy of CRT can be compromised by the presence of ischemia. Therefore, the main goal of this project is to develop a better understanding of the role ischemia plays in CRT. Here, we developed a pipeline to post-process and analyze experimental data acquired in a clinically relevant normal swine model at different heart rates. Using software such as QLab and MeVis Lab, we were able to analyze and segment echo data as well as post-process pressure-volume and epicardial sock electrode data using an in-house MATLAB code. The pipeline developed here will

be used for post-processing of subsequent experimental data in the swine model of the left branch bundle block with ischemia, which will then be used to develop computer models for optimization of CRT.

INVESTIGATION OF SPIRAL FLOW BEHAVIOR THROUGH ADDITIVELY MANUFACTURED NOZZLES IN MINIMUM QUANTITY LUBRICATION

Shubhankar Gandhi
Category & Time: Mechanical, Environmental & Civil Engineering, Section 2, 2:30 - 3:45 PM
Poster: 255
Mentor(s): Patrick Kwon

Minimum quantity lubrication (MQL) is a sustainable manufacturing technique that can be used in lieu of traditional flooded lubrication method. In the MQL technique, an extremely small amount of lubricant after atomized is sprayed onto the cutting surfaces of a tool through a nozzle by compressed air. In order to maximize the efficiency of MQL, the nozzle must be designed to spray the lubricant droplets to the tool, which the current design does not allow to do. Therefore, many types of nozzles have been designed to the flow the compress air in spiral motions. This study investigates the flow behavior of the oil and air mixture, at the tip of the nozzles being designed. To try out various designs, the nozzles are fabricated using additive manufacturing process of Electron Beam Melting (EBM). The nozzles are made from Ti 64 and have the same outside diameter of 4.5 mm. So far, seven different nozzle designs are tested, which have between three and five fin internal helical cores. Flow experiments are performed on these different nozzles at 40 psi in an insulated chamber. High-speed cameras are places at different locations in this chamber to create a set of photographs that are post processed to understand the exact flow behavior.

ANALYSIS OF DISPERSIVE FIELDS IN SIMULATIONS OF TURBULENT CYLINDER WAKE

Christian Luedtke
Category & Time: Mechanical, Environmental & Civil Engineering, Section 2, 2:30 - 3:45 PM
Poster: 256
Mentor(s): Junlin Yuan

Understanding the turbulent flow around obstacles has significant importance for many fields, such as flow over roughness of engineering surfaces and natural/urban canopies. Currently, turbulence-modeling approaches in which the obstacles are not resolved typically ignore the turbulence production and transport due to the dispersive terms resulted from time-mean spatial perturbations; this leads to under-prediction of fluxes. Insight into the interaction between the dispersive and turbulent fields allows for better understanding of mesoscale weather forecasting and urban air flow. Here, we take a first step in understanding the dispersive production using flows over a single cylinder, which is a simplified case in which the dispersive shear are two-dimensional. The present study seeks to verify the in-house code which uses large eddy simulations (LES) and the immersed boundary method to model turbulent flow past a square cylinder. To optimize computational cost and accuracy the critical geometry resolution was determined by a grid-convergence study. For a verified case the dispersive fields were extracted and their contribution to the flow mechanics analyzed. Expanding the knowledge of the dispersive fluxes contributes to progressing computational models towards practical applications over complex geometries.

THE EFFECT OF HAND EXERCISES ON FORCE APPLICATION AND DIRECTION OF THE THUMB

Nicholas Vanoost
Category & Time: Mechanical, Environmental & Civil Engineering, Section 2, 2:30 - 3:45 PM
Poster: 257

Osteoarthritis is a highly prevalent joint disease that affects older adults resulting in the loss of mobility and strength of the hand. The thumb is the most common area of the hand that is affected by arthritis, however no studies have evaluated the effect of osteoarthritis on thumb force application. Physically exercising joints is shown to improve range of motion as well as strengthen muscles. To determine the effect of exercise on force capabilities of the thumb, applied force magnitudes and directions data were obtained from participants in three groups, Older Arthritic, Older Healthy, and Younger Healthy, 1) prior to completing hand exercise, 2) following two weeks of stretching exercises and 3) following four weeks of stretching and strengthening hand exercises. All data were collected using a custom built apparatus attached to a multi-axis load cell. Participants were asked to complete four force tasks at each testing date: radial abduction, radial adduction, palmar abduction, and palmar adduction. The maximum force applied to the load cell over three repetitions of the exercise was used to calculate an average force generated by the participant. Our study showed that the exercises increased Older participants' force application between the first test and the final test. The study also revealed that the Younger group increased their strength in the thumb. This information shows that exercising the muscles of the hand impacts the amount of force that can be applied using the thumb.

MECHANICAL PROPERTIES OF THE EXTRACELLULAR MATRIX WITHIN THE URINARY BLADDER FOLLOWING DIABETIC CYSTOPATHY
Ari Hollander
Category & Time: Mechanical, Environmental & Civil Engineering, Section 3, 2:30 - 3:45 PM
Poster: 260
Mentor(s): Sara Roccabianca

In the United States alone, 29 million individuals suffer from diabetes. Many of these people struggle with a chronic urinary disorder called diabetic cystopathy. This is a urinary tract dysfunction that results in decreased bladder sensation and poor contractility of the detrusor muscles due to impaired neurological connections. The bladder thus overfills becoming enlarged and dysfunctional. It is unclear how the bladder increases in volume and how the mechanical properties of the extracellular matrix are affected by this change, specifically collagen and elastin fibers. To assess this problem, various testing was done such as ring tests, histologies, and opening angle tests. The ring tests were done by dissecting the bladder from diabetic and control adult rats and cutting the samples into ring shapes. Then, the rings were attached to a uniaxial machine and stretched to analyze the force with a controlled strain. With this experimental data, a stress versus strain plot was constructed which indicated that diabetic bladders are more distensible. This suggests that there is an increase in elastin content which overlaps with histology analysis and previous research which showed an increase in elastin in diabetic patients. Therefore, the amount of and relationship between elastin and collagen contribute to how the bladder mechanically changes due to diabetes. This will be analyzed by opening angle tests on diabetic bladders soaked in the enzyme elastase to examine the effect of the elastin.

DEVELOPMENT OF FUNCTIONAL FINGER SPACE MAP FOR THE INDEX FINGER
Ece Erder
Category & Time: Mechanical, Environmental & Civil Engineering, Section 3, 2:30 - 3:45 PM
Poster: 261
Mentor(s): Tamara Bush

Understanding the abilities of the fingers and hand is important from a rehabilitation standpoint. To improve this understanding, it is necessary to quantify the motions of the finger and its ability to apply force; when the motion and force values are combined together, it creates a functional finger space. Mapping the functional finger space and force vectors is an important application to allow future researchers to have a better understanding on their biomechanical designs regarding hand and finger movements. Especially for individuals with reduced hand and finger function, like osteoarthritis and rheumatoid arthritis patients, the maps increasing the efficiency of designing devices. This study investigates the directional coordination of force vectors generated by the index finger during push movement. Right-handed, healthy subjects were instructed to exert push force on an externally stabilized apparatus with the distal phalanges of their right hand. Subjects applied forces on the apparatus at four separate locations on their hand, for three different heights (2.54 cm, 1.905 cm, 1.27 cm) for each position. The participants will be instructed to push their index finger against the force sensor; four locations in lined with the index finger, each location being more proximal. Data are being analyzed and mapped to the motion space of finger.

PROPOSED DESIGN OF AN ARTICULATING WHEELCHAIR FOR PATIENTS WITH SPINAL CORD INJURY
Brianna Forsthoefel
Category & Time: Mechanical, Environmental & Civil Engineering, Section 3, 2:30 - 3:45 PM
Poster: 262
Mentor(s): Tamara Bush

Individuals with spinal cord injuries are at a high risk to develop pressure ulcers due to their limited mobility. Studies indicate 50 to 85% of spinal cord injury patients will develop a pressure ulcer at some point in their life. Approximately 65% of sitting-acquired pressure ulcers occur under the ischial tuberosities, sacrum, coccyx, and trochanteric regions of the buttock. It is of interest to determine which seating positions most reduce the force distribution in these regions to limit the degradation of soft tissue that leads to the development of pressure ulcers. To create a more even pressure distribution, an articulating wheelchair has been developed to allow the patient to adjust more contact points than a standard wheelchair. The proposed design has three articulation points: seat pan tilt, back recline, and thorax/pelvic support rotation. A typical wheelchair only allows for back recline and a tilt-in-space. The seat pan of the proposed design differs from standard wheelchairs as the seat tilts separately from the back recline. Pressure mat testing has verified that a separate tilt reduces the pressure on the ischial tuberosities. The back articulation rotates the thorax and pelvic supports within the seat back between a slouched and erect position. By implementing the three separate

movements for adjustability of the wheelchair, the patient is able to form the most comfortable posture by reducing points of high pressure.

EXPERIMENTAL DETERMINATION OF THE LAMINAR FLAME SPEED OF A METHANE/AIR MIXTURE AT 298 KELVIN AND 1 BAR

Lauren Chance
Category & Time: Mechanical, Environmental & Civil Engineering, Section 3, 2:30 - 3:45 PM
Poster: 263
Mentor(s): Elisa Attard

As more alternative and environmentally-friendly fuels are being explored in the transportation industry, obtaining fundamental properties of these fuels aids in determining which can be considered on a large scale. The laminar flame speed is a vital parameter of a fuel that characterizes its performance during combustion. It is defined as the rate of cold flame front propagation of a one-dimensional spherical flame to that of the unburned gas. A constant-volume cylindrical vessel is used to experimentally obtain the laminar flame speed of a methane/air mixture at different equivalence ratios. Schlieren photography captures the outwardly-propagating spherical flame in its region of constant pressure. A MATLAB image-processing code is used to determine the rate of radial growth of the flame in order to calculate the laminar flame speed.

PHARMACOLOGY & TOXICOLOGY

THE RROLE OF AHR AND TSPO IN MODULATING MITOCHONDRIAL ACTIVITY AND REGULATING TCDD-INDUCED LIVER INJURY

Angel Ojeda
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 266
Mentor(s): John LaPres

The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor that mediates most, if not all, of the toxicity of planar aromatic hydrocarbons, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).
TCDD exposure is associated with many pathologies, including tumorprogression, immunosuppression and metabolic syndrome. Though much is known about TCDD, the AHR's most notable exogenous ligand, very little is known about its endogenous ligands. Putative endogenous ligands include cholesterol, heme, and tryptophanmetabolites. Interestingly, many of these metabolites have been associated with the translocator protein (TSPO). TSPO is a mitochondrial protein whose function is unclear. Recently, we have shown that the AHR can be found in the intermembrane space of the mitochondria. The overlap in cellular localization and putative endogenous ligands have led us to hypothesize that crosstalk between the AHR and TSPO modulate mitochondrial activity and impact TCDD-induced liver injury. To test the hypothesis, we have begun creating AHR- and TSPO-deficient hepa1c1c7 cells (a murine hepatoma cell line) using CRISPR-Cas9. These cells will be analyzed using quantitative real-time polymerase chain reaction (qRTPCR), cell viability and mitochondrial activity assays, and cholesterol measurements. Preliminaryresults suggest that loss of TSPO alters the cell's growth rate and response to AHR and TSPO ligands. These results support the hypothesis that the AHR and TSPO signaling pathways interact to influence mitochondrial activity and this might explain TCDD-induced metabolic syndrome.

ALTERING THE FLEXIBILITY OF RGS8 AND RGS19 THROUGH MUTATION OF ?4-?5 SALT BRIDGE RESIDUES

Josiah Quinn
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 267
Mentor(s): Richard Neubig

Regulators of G-protein Signaling (RGS) act as important mediators of signal transduction by G-protein Coupled Receptors. Previous studies have shown that flexibility of these proteins plays a role in thiadiazolidinone (TDZD) inhibition. Understanding how TDZD potency of inhibition changes with RGS protein flexibility will allow for the development of more tailored RGS inhibitors. We hypothesized that a presence or lack of a salt bridge between the α4 and α5 helices of these proteins is important to their differing flexibilities. An RGS8 E84L mutation was made to lead to a disruption of this salt bridge, while a L118D mutation in RGS19 was made to lead to its creation. Differential Scanning Fluorimetry (DSF) was used to determine the thermal stability of each of these proteins; this was used as an indicator of

protein flexibility. Comparison of the melting temperatures of the wild type and mutated proteins clearly demonstrated the impact these mutations had on flexibility. RGS8 E84L reduced thermal stability by 8°C compared to wild type, while RGS19 L118D resulted in a 7°C increase in stability. Hydrogen-Deuterium Exchange (HDX) can be used to determine which protein regions differ in flexibility. Upon incubation of protein in D2O, exposed amide hydrogens in the backbone of the protein will exchange with deuterium. Protein regions with increased deuterium incorporation indicate increased protein flexibility. Performing HDX will provide more detailed information about these changes in flexibility. These results indicate that the α4-α5 salt bridge is a substantial driver of RGS protein stability and flexibility.

EFFECT OF BISPHENOL S ON GAP JUNCTION INTRACELLULAR COMMUNICATION IN THECA CELLS
Juliet Salivo
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 268
Mentor(s): Almudena Veiga-Lopez

A wide range of consumer products used today are thought to contain endocrine disrupting chemicals (EDCs). EDCs pose a potential health threat to humans as exposure can occur through food, water, thermal paper receipts, and/or consumer products containing polycarbonate plastic or epoxy resins. The most prevalent EDCs worldwide are bisphenols, specifically bisphenol A (BPA). Regulatory changes impacting the production of BPA has caused an increase in the production of other analogous chemicals with unknown exposure risks, such as bisphenol S (BPS). Pregnant women are an especially vulnerable group to such chemical exposures since most EDCs can cross the placental barrier and enter fetal circulation. Furthermore, it has been recently demonstrated that-in utero-exposure to BPS can impact the endocrine capacity of the placenta and points to a potential disruption in intercellular communication. Ovarian cyclicity is a process that is very tightly regulated by intercellular communication and hormone production, both of which could be affected by exposure to EDCs. Our preliminary findings have shown that BPS can enhance intercellular communication in ovarian cells. However, the specific mechanism by which this occurs remains unknown. The current study attempts to better understand the mechanism(s) by which BPS enhances gap junction intercellular communication in ovarian theca cells. We hypothesized that BPS enhances gap junction intercellular communication through the MEK/MAPK pathway. To test our hypothesis, we use ovine ovarian theca cells. Primary ovine theca cells will be exposed to either a DMSO vehicle or BPS (at 200 ng/ml), with or without pathway-specific inhibitors. Following exposure, a scrape load/dye transfer assay will be employed. This assay uses a low-weight fluorescent dye, lucifer yellow, to assess gap junction intercellular communication in live cells. Images were quantified using Fiji-Image J software. Scrape load/dye transfer assay experiments using pathway-specific inhibitors are underway to evaluate the known gap junction pathways through which this may be occurring.

THE PROGRESSION AND PERSISTENCE OF OZONE-INDUCED ATROPHY OF NASAL TURBINATES
Cassidy Harris
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 269
Mentor(s): Jack Harkema

Ozone is a common type of air pollutant found in the tropospheric region of the atmosphere that humans are exposed to. It is created when nitrogen oxides (NOx) and volatile organic compounds (VOC's) react with UV sunlight to create a photochemical smog. In this comprehensive study, we assessed the effects of episodic exposure of ozone on nasal turbinates as well as the cellular mechanisms underlying the loss of this turbinate bone in rats. Sixty male F344/N rats were utilized in this study and organized into 10 different groups exposed to either air or 0.8ppm O^3 for 4h/d for either 2 or 6 weeks with varying time spans for subsequent recovery. After the necropsies were completed, the T1 section of the nose of each animal was analyzed and the areas of the maxilloturbinates, the turbinate bone, and mucosa were morphometrically calculated and graphed. It was found that the rats who were exposed to ozone for 6 weeks experienced the greatest loss of both turbinate and bone area while those exposed for only 2 weeks showed little to no loss. The rats who had a 6 week recovery period after exposure regenerated some of the turbinate and bone; however, there was still an evident loss of bone in these sections. Finally, it was determined that the mucosa area grew significantly when rats were exposed to ozone as a result of the inflammation in the tissue from an increase of eosinophils. This study allows us to understand the effect of episodic exposure of ozone on nasal turbinates and assess the risk of development of atrophic rhinitis. Research funded by the National Institutes of Health (NIH).

ACETAMINOPHEN CYTOTOXICITY TRIGGERS FIBRIN(OGEN) CROSS-LINKING IN CULTURED HEPATOCYTES
Toteona Gray
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 270
Mentor(s): Asmita Pant, James Luyendyk

Acetaminophen (APAP) overdose is one of the leading causes of liver failure in United States. APAP-induced hepatotoxicity is associated with activation of the coagulation cascade and accumulation of the clotting protein fibrin(ogen) in the injured liver. Our laboratory has shown previously that fibrin(ogen) undergoes cross-linking by transglutaminases in the injured liver, including coagulation factor XIII (FXIII) and tissue transglutaminase (TGM2). Whereas FXIII circulates in plasma bound to fibrin(ogen), we posited that hepatocyte-associated TGM2 may be sufficient to cross-link fibrin(ogen). Here, we tested the hypothesis that APAP-killed hepatocytes can cross-link fibrin(ogen). Primary hepatocytes were isolated from C57BL/6 wild-type mice by perfusion and collagenase digestion. The hepatocytes were treated with various concentrations of APAP (0-5 mM) in serum-free William's Medium E for 17 hours in presence or absence of human fibrinogen (10 μg/ml). APAP-induced cytotoxicity was determined by measuring release of alanine aminotransferase (ALT) into the culture supernatant. APAP caused a concentration-dependent increase in ALT release that was not impacted by presence of exogenous fibrinogen. Using capillary electrophoresis we measured levels of high-molecular weight cross-linked fibrin(ogen) associated with the hepatocytes. Preliminary results suggest that cultured hepatocytes can cross-link exogenous fibrinogen and that this is increased by APAP cytotoxicity. The results suggest that APAP-injured hepatocytes can cross-link fibrin(ogen), implying a novel coagulation-independent mechanism whereby fibrin(ogen) structure may change during liver injury.

5-HT7 RECEPTOR'S ROLE IN GASTROINTESTINAL MOTILITY OF THE MURINE COLON
Harim Delgado
Category & Time: Pharmacology & Toxicology, Section 1, 2:30 - 3:45 PM
Poster: 271
Mentor(s): James Galligan

5-hydroxytryptamine (5-HT) regulates gastrointestinal (GI) and gut motility via activation of 5-HT receptors on enteric neurons and gut smooth muscle. Patients diagnosed with irritable bowel syndrome (IBS), exhibit significantly altered levels of 5-HT and irregular patterns of GI motility. Several 5-HT receptors subtypes have been identified and studied as potential therapeutic targets to treat IBS symptoms, including constipation, diarrhea, and abdominal pain. Our objective in this study is to identify 5-HT7 receptor contributions to controlling GI motility by measuring isometric muscle tension in organ bath studies using GI tissues from 5-HT7KO and control rats. Since 5-HT7 receptors may modulate the activity of intrinsic primary afferent neurons (IPANs) and descending projecting pathway neurons, we hypothesize an overall decrease in smooth muscle contractibility and relaxation in 5-HT7 KO rats. We constructed dose response curves for contractions caused by for exogenous 5-HT and the muscarinic acetylcholine receptor agonist, bethanechol. Subsequent application of 5-HT3 and 5-HT4 receptor antagonists (ondansetron (1uM) and GR 113808 (1uM), respectively) should further reduce smooth muscle contractions and relaxations in tissues from our animal model.

THE SPINAL CORD ASTROCYTES DERIVED FROM HUMAN TRANSGENIC SOD1G93A MICE ARE MORE SUSCEPTIBLE TO MEHG THAN FROM WILD TYPE CELLS
Jessica Lagosh
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 274
Mentor(s): William Atchison

Interaction between genetic and environmental factors could explain differences in susceptibility of individuals to amyotrophic lateral sclerosis (ALS). The environmental neurotoxicant methylmercury (MeHg) has indicated its toxicity to the central nervous system as characterized by motor and cognitive impairments. Our previous study in human transgenic SOD1G93A (hSOD1G93A) mice, an ALS mouse model, exhibited an increase of intracellular calcium ([Ca2+]in) in brainstem slices when exposed to non-toxic levels of MeHg. This concentration of MeHg hastened disease onset in hSOD1G93A mice but caused no adverse effect in human wild type SOD1 (hSOD1WT). We hypothesized that MeHg induced the elevation of [Ca2+]in in spinal cord astrocytes (SCAs) in hSOD1G93A sooner than in hSOD1WT consequently contributing to cell death. The induction of [Ca2+]in were determined using a ratio-metric calcium indicator, Fura-2AM to compare the susceptibility between SCAs from hSOD1G93A and wild type cells (non-carrier) during MeHg exposure. Exposure of SCAs to 5µM MeHg indicated bi-phasic [Ca2+]in elevations. The biphasic onset of [Ca2+]in elevations appear to occur sooner in bipolar shaped SCAs than in star shaped SCAs. The onset of [Ca2+]in elevations appear to

occur sooner in SCAs from hSOD1G93A than from non-carrier cells. When antioxidant N-acetyl cysteine (NAC) (1mM) was applied 2h prior to exposure to 5µM MeHg, the biphasic onset of [Ca2+]in elevations were delayed in SCAs from hSOD1G93A. These results suggest the different morphologies of SCAs as well as genetic background played a role in susceptibility to MeHg. The delayed onset of [Ca2+]in elevations in SCA from hSOD1G93A could be a mechanism by which NAC protects SCAs from MeHg-induced toxicity.

TO CHARACTERIZE THE MECHANISM BY WHICH N-ACETYL CYSTEINE IN PROTECTION OF SPINAL CORD ASTROCYTE FROM METHYLMERCURY-INDUCED TOXICITY

Laura Franco Zapata
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 275

The environmental neurotoxicant methylmercury (MeHg) affects the central nervous system. It induces toxicity that contributes to paresthesia, motor deficits, visual constriction, auditory impairment, and cognitive decline. Loss of redox homeostasis and induction of excitotoxicity are cellular mechanisms by which methylmercury induces astrocyte degeneration. Loss of redox homeostasis includes an increase of reactive oxygen species and a decrease of antioxidant glutathione (GSH). Pre-treatment of spinal cord astrocyte cell cultures (SCAs) with antioxidant n-acetyl cysteine (NAC) has exhibited protection from MeHg-induced cell death. NAC is a substrate precursor for antioxidant glutathione (GSH) synthesis. The mechanism by which NAC protect SCAs from MeHg remains unknown. We hypothesized that NAC could activate a master regulator of antioxidant genes called nuclear factor erythroid2-related factor2 (Nrf2). Activation of Nrf2 regulates several antioxidant genes including glutamate-cysteine ligase catalytic subunit (Gclc,a rate limiting enzyme of GSH synthesis), the cystine/glutamate antiporter (Slc7A11,a cysteine precursor transporter), and multidrug resistant protein transporter1 (Mrp1,a GSH transporter). The expression levels of Gclc, Slc7a11and Mrp1genes in the presence of NAC treatments compared to control treatments were determined to indicate the activation of Nrf2. The expression of the cystine/glutamate antiporter and Mrp1 transporter were determined using immunocytochemistry. NAC could induce Nrf2 activation through the up-regulation of Gclc, Slc7a11and Mrp1gene expressions. The induction of Nrf2 by NAC could increase the expression of these transporters and this could suggest a novel mechanism by NAC in cell protection.

ROLE OF INTERNAL CALCIUM POOLS DURING ACUTE METHYLMERCURY-MEDIATED INCREASE IN INTERNAL CALCIUM CONCENTRATION IN C57BL6J MOUSE SPINAL CORD SLICES

Nicole Rivera
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 276
Mentor(s): William Atchison

Methylmercury (MeHg) is an organic environmental contaminant. It affects both sensory and motor neurons. In isolated motor neurons in culture, a key contributor to MeHg neurotoxicity is dysregulation of intracellular calcium (Ca2+)i homeostasis and subsequent hyperexcitability. The MeHg-mediated increase in Ca2+i concentration ([Ca2+]i) occurs in two kinetically distinct phases. Phase 1 is due to Ca2+ release from the cytosolic Ca2+ pools: mitochondria and smooth endoplasmic reticulum (SER). Phase 2 corresponds to Ca2+ entering the cell across the plasma membrane by several mechanisms. The relative contributions that mitochondria and SER have to MeHg-induced increases in motor neuron [Ca2+]i have not yet been reported. The aim of this project is to elucidate to what extent internal Ca2+ pools contribute to elevations of [Ca2+]I following an acute 20μM MeHg exposure. Lumbar sections spinal cord of adult C57BL6J mice are exposed to MeHg during 15 min through a real-time perfusion system. Ca2+ changes in motor neurons are recorded using Fluo4-AM, a fluorescent Ca2+ indicator at 15min of MeHg exposure in the absence and presence of carbonyl cyanide m-chlorophenyl hydrazone (CCCP) and thapsigargin, to deplete the mitochondria and to block Ca2+ uptake through the endoplasmic reticulum Ca2+-ATPase (SERCA), respectively. In the presence of these chemicals, MeHg-mediated [Ca2+]i is hypothesized to be higher compared to MeHg treatment alone, especially during Phase 1, which is dependent on Ca2+i stores. This research may help understand mechanisms involved in the motor neuron Ca2+ dysregulation during MeHg toxicity.

ROLE OF INTERNAL CALCIUM POOLS DURING METHYLMERCURY-INDUCED CELL DEATH IN THE C57BL6J MOUSE
Andrea Aldaz
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 277
Mentor(s): William Atchison

Methylmercury (MeHg) is an environmental neurotoxicant of contemporary concern. It causes a cascade of effects leading to cell death. MeHg targets α motor neurons (αMN) located in the lumbar region of the spinal cord. αMN are important for skeletal movement; their degeneration is a key feature of the neurodegenerative disease amyotrophic lateral sclerosis (ALS). MeHg-induced cell death results from uncontrolled increases in internal calcium concentration ($[Ca^{2+}]_i$). The initial effect is release of Ca^{2+} from organelles (mitochondria and smooth endoplasmic reticulum (SER)) followed by extracellular Ca^{2+} entry. The comparative roles of mitochondria and SER to increases in $[Ca^{2+}]_i$ by MeHg have not yet been determined. The purpose of this study is to elucidate the immediate and delayed contribution that mitochondria and SER provide during acute MeHg-induced cell death. This is being performed using lumbar spinal cord slices isolated from C57BL6J mice, along with a commercially-available viability assay that utilizes calcein-AM, a fluorescent green dye that stains viable cells. Cell viability is determined following a 15min [20μM] MeHg exposure in the absence and presence of chemicals that modulate internal Ca^{2+} pools. Carbonyl cyanide m-chlorophenyl hydrazone (*CCCP*) depolarizes the inner mitochondrial membrane increasing cytosolic Ca^{2+}. Thapsigargin blocks the SER Ca^{2+}-ATPase (SERCA), preventing uptake of cytosolic Ca^{2+}. We hypothesize that the ability of these two compounds to increase $[Ca^{2+}]_i$ increasing further MeHg-induced cell death. This project is important because it sheds light on the role of $Ca^{2+}{}_i$-containing organelles- mitochondria and SER to MeHg-induced motor neuronal death.

IN VIVO METHYLMERCURY EXPOSURE INTERACTS WITH THE GENETIC PREDISPOSITION TO AMYOTROPHIC LATERAL SCLEROSIS IN MICE EXPRESSING THE HUMAN CU2+/ZN2+ DIMUTASE 1 MUTATION
Jake Spitsbergen
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 278
Mentor(s): William Atchison

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease associated with damage to motor neurons in the brain and spinal cord that has been linked to calicum-mediated excitotoxicity. The environmental neurotoxicant methylmercury (MeHg) is known to cause damage similar to that seen in ALS (e.g. intracellular calcium dysregulation, sensorimotor disturbances). ALS can be modeled using mice expressing the Cu^{2+}/Zn^{2+} superoxide dismutase 1 (hSOD1) gene mutation ($SOD1^{G93A}$). These mice express phenotypes similar to those found in ALS patients as they age and can be used to effectively interrogate gene by environment interactions in ALS. Here, $SOD1^{G93A}$ and appropriate control mice were exposed to MeHg via drinking water at a concentration of 3 ppm beginning at post-natal day (PND) 28. Body weight and hind limb cross measurements were taken three times weekly in addition to weekly assessments of motor function (i.e. maximum possible running speed). Mice from each genotype + exposure group were sacrificed at (PND) 28, 47, 64, or 84 and lumbar spinal cord slices were prepared for calcium imaging using scanning confocal microscopy. Preliminary data indicate that there is a decrease in body weight among all MeHg-exposed mice compared to controls. Running speed also slowed among the MeHg-exposed and $SOD1^{G93A}$ mice. Early results indicate that spinal cord tissue from the MeHg+$SOD1^{G93A}$ group experienced a greater KCL-provoked intracellular calcium increase compared to controls. These data suggest that environmental exposure to MeHg, in combination with the hSOD1 gene mutation, contributes to expression of the ALS phenotype of neural degeneration.

EFFECTS OF EXCITATORY AMINO ACID TRANSPORTER 1 AND 2 AFTER METHYLMERCURY EXPOSURE IN MICE CORTICAL AND CEREBELLAR ASTROCYTES
Krystal Santiago
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 279
Mentor(s): Gretchen Rivera Lopez, William Atchison

Excitatory amino acid transporters (EAATs) have the important role of removing extracellular glutamate from the synaptic cleft. They have been characterized as critical in protecting neurons against glutamate-induced excitotoxicity. Methylmercury (MeHg) is an environmentally acquired toxicant identified as excitotoxic which induces excessive release of glutamate. In addition, MeHg preferentially accumulates in astrocytes, induces astrocytic swelling, and inhibits glutamate uptake from astrocytes. Consequently, this disrupts glutamate homeostasis, glutathione synthesis (an

important antioxidant for toxicity) and eventually excitotoxic neuron death. The relative role of astrocytes from cerebellum and cerebral cortex, two brain regions affected by MeHg has not been thoroughly defined. The approach of this study was to examine EAAT1 and EAAT2 outcomes after MeHg exposure in isolated cortical and cerebellar astrocytes from two strains of mice: wildtype, and superoxide dismutase-1G93A (G93A), a mouse model for familial forms of amyotrophic lateral sclerosis (ALS). We hypothesized that MeHg exposure in cortical and cerebellar astrocytes could exacerbate dysfunction of EAAT1 and EAAT2 in the G93A group. To assess the effects of MeHg in the transporters, cortical and cerebellum astrocytes were extracted from the two genotypes, and exposed to 1, 2 or 5 μM MeHg for 3hrs. The capacity of EAAT1 and EAAT2 expression after MeHg exposure, will be examined using immunocytochemistry. Modulating EAATs function may be a therapeutic target to attenuate excitotoxicity-induced pathogenesis in diseases like ALS.

UNDERSTANDING THE DIFFERENCES IN INHIBITION OF P2Y1 AND P2Y12 RECEPTORS BY DT-678, CLOPIDOGREL, AND TICAGRELOR IN 1321N1 ASTROCYTOMA CELLS

Mackenzie Deters
Category & Time: Pharmacology & Toxicology, Section 2, 2:30 - 3:45 PM
Poster: 280
Mentor(s): Dale Lauver

Heart attack and stroke are the leading cause of death in the developing world. Current treatments, including the administration of antiplatelet drugs have been shown to greatly reduce risk. The antiplatelet drug, Clopidogrel (Plavixâ), irreversibly blocks the P2Y12 receptor, thereby inhibiting the activation of platelets by ADP. Clopidogrel, being a prodrug, requires the active metabolite to be released through bioactivation by cytochrome P450s (CYP450s). This is problematic, seeing that clopidogrel is ineffective in 60% of Asians and 30% of Caucasians due to a polymorphism in CYP2C19. Alternatively, a novel conjugate of the active metabolite of clopidogrel, DT-678, shows similar effects but instead, releases the active metabolite without bioactivation by CYP450. DT-678 is activated through a thiol exchange reaction with glutathione. Preliminary studies in New Zealand white rabbits, have shown that DT-678 is effective in inhibiting platelet activation while reducing the prolonged bleeding time compared to other antiplatelet drugs, such as clopidogrel and ticagrelor. The purpose of the present study was to understand, using a calcium mobilization assay of 1321N1 astrocytoma cells, the differential inhibition of P2 purinergic receptors by DT-678 compared to clopidogrel and ticagrelor. The G-protein coupled receptors, P2Y12 and P2Y1, play a prominent role in the activation of platelets. By evaluating the differences by which these agents inhibit purinergic receptors, we hope to determine the mechanisms that may account for the changes in bleeding seen when treated with DT-678 compared to other antiplatelet agents.

CYTOTOXIC EFFECTT OF IODINATED CONTRAST MEDIA ON RENAL PROXIMAL TUBULE CELLS

Terry Everett
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 283

Iodinated contrast media (ICM) are used in millions of cardiovascular procedures every year to analyze vessel morphology and determine the severity of atherosclerotic disease. Many of these procedures are performed on individuals who have preexisting renal insufficiency. Following the administration of ICM, these patients are at increased risk for the development of worsening renal function, a condition known as contrast-induced acute kidney injury (CI-AKI). CI-AKI is clinically defined as a 0.5 mg/dL or 25% increase in serum creatinine concentration. This loss of kidney function is reversible, typically lasting a maximum of 5 days, however it has been shown to cause long term adverse effects. Compared to those who have not developed CI-AKI post administration patients, who do, have a higher probability of morbidity and mortality. The exact mechanism(s) for this disparity are unknown, however direct cytotoxic effects to the renal epithelium are thought to be involved. Recent studies suggest that proximal tubular epithelial cells are more sensitive to the toxic effects of ICM than those in the distal tubule. One key difference, and what we believe may have causative role, is the different apical transporters that they express. To test this hypothesis, we applied chemical inhibitors of various apical transport mechanisms to RPTEC/TERT1 jhj9cells to determine if they reduce the cytotoxic effects of ICM. In future studies we plan to use this model to evaluate targeted therapy to reduce incidence of CI-AKI.

ORGANIC COMPONENTS OF AMBIENT PARTICLE- AND VAPOR-PHASE AIR POLLUTANTS INDUCE OXIDATIVE STRESS IN HUMAN LUNG CANCER CELLS WITHOUT AFFECTING CELL VIABILITY
Ana Estrada
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 284
Mentor(s): Carine Holz, Ning Li

Lung cancer with 80% being non-small cell lung cancer (NSCLC) has the highest incidence and mortality worldwide and one of its major risk factor is air pollution. Ambient air pollutants include particulate matter (PM) and vapor-phase pollutants (vapor). While the association between PM and NSCLC has been established the contribution of vapor to this disease is understudied. Generation of cellular oxidative stress by redox-active organic chemicals is a major mechanism for the adverse health effects of air pollution. In non-cancerous cells PM-induced oxidative stress results in inflammatory response and cell death. We hypothesized that ambient PM and vapor promote NSCLC cell growth through induction of oxidative stress. Organic extracts of PM (C-PM) and vapor (C-V) were prepared from air samples collected in Compton, CA. Organic extract of diesel exhaust (DE), a known carcinogen, was included for comparison.None of the pollutants had significant cytotoxicity at the concentrations tested (5-50 μg/ml or 0.25-1 m3/ml). Exposure of NSCLC cells (NCI-H1975) toDE (5-50 μg/ml) induced dose-dependent increase of antioxidant enzyme heme oxigenase-1 (HO-1). Based on mass concentration (10 μg/ml), C-PM was a stronger HO-1 inducer than DE. Comparison of C-PM and C-V showed that 1 m3/ml both pollutant types activated HO-1 with C-V being more potent. Combination of C-PM and C-V did not have any additive/synergstic effect on HO-1 compared to C-V alone. Our results suggest that air pollution may promote NSCLC growth by inhibiting cell death through a mechanism involving oxidative stress and vapor may be more carcinogenic than PM.

THE EFFECTS OF TRANSIENT RECEPTOR POTENTIAL VANILLOID 4 CHANNEL ON ARTERY RAREFACTION AND NEUROINFLAMMATION
Kelsey Ordway
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 285
Mentor(s): Anne Dorrance

Transient Receptor Potential Vanilloid 4 (TRPV4) channels are non-selective cation channels that allow calcium influx into endothelial cells and mediate endothelium-dependent artery dilation. We have previously shown that TRPV4 knockout (TRPV4 -/-) rats have reduced cerebral perfusion, blunted endothelium-dependent dilation and cognitive impairment. We hypothesize that the reduction in cerebral blood flow in TRPV4 -/- rats is due, in part, to a reduction in the number of blood vessels. Additionally, we hypothesize that changes in cognition in TRPV4 -/- rats are associated with increased microglia activation and de-myelination. 10-12-month-old male TRPV4 -/- rats were compared to Wistar rats. The endothelial cell marker Isolectin GS-IB4 was used to assess changes in the number of vessels. There was no difference in total vessel number between groups (5.1± 0.3 vs 5.1± 0.4; Control (n=6) vs TRPV4-/- (n=5), p=0.967). Additional samples were stained using anti-myelin basic protein antibody to examine potential changes in myelination and with the microglia marker, IBA-1, to assess the number of activated microglia. We expect that TRPV4 -/- rats will have decrease in myelination, and increased number of activated microglia. These changes will be associated with the cognitive dysfunction in the TRPV4-/- rats. Our results suggest that the reduced cerebral blood flow in the TRPV4-/- rats is not due to fewer brain vessels but is associated with the blunted artery dilation. TRPV4 channels may play an important role in the development of vascular dementia.

EFFECT OF HOUSING ON WEIGHT GAINED AND OBESITY'S EFFECT ON VASCULAR COGNITIVE IMPAIRMENT
Amna Ahmad
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 286
Mentor(s): Anne Dorrance

Obesity is a major factor contributing to cerebrovascular disease. Our study investigated the effect of obesity on vascular cognitive impairment, and how the differences in bedding and housing impact the development of obesity. Previous research shows that corn cob bedding reduces the efficiency in feed conversion for mice fed a high fat diet. However, based on our preliminary data we hypothesize that the Allentown corn cob cages cause rats fed the high fat diet to gain the most weight, and that the high fat rats from all housing categories will have cognitive impairment. 24 week old male Sprague Dawley rats (n=36) fed a control diet, control bioserve diet, or high fat diet were housed in Allentown cages with normal or corn cob bedding, or in Static cages with normal bedding (n=4 per group). Their body

weights were tracked for 24 weeks and blood pressures were taken once a week. The rats fed the high fat diet that were housed in the corn cob Allentown cages had an average weight of 560.4 ± 57.7 grams, which was significantly higher than the other groups. Starting on the 24th week, behavior testing including barnes maze, open field, and novel object were administered. A Doppler scan of the brain was taken before the rats were sacrificed in order to analyze cerebral blood flow. The potential implications of this study are far-reaching as housing differences have never been shown to impact weight gain in rats.

REDUCED BLOOD PLASMINOGEN LEVELS MAY CONTRIBUTE TO LIVER FAILURE AFTER ACETAMINOPHEN OVERDOSE
Jaquia White
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 287
Mentor(s): Bryan Copple

Acetaminophen is one of the most frequently used pain relievers and antipyretics. Although this provides great benefit, acetaminophen overdose is the number one cause of acute liver failure in the US. Recent studies have revealed that blood plasminogen levels are substantially reduced in patients suffering from acetaminophen-induced acute liver failure. Further, our studies have demonstrated a key role for plasminogen in liver repair after injury. Based upon these findings, we propose the hypothesis that diminished plasminogen levels after acetaminophen overdose leads to impaired liver regeneration and liver failure. To test this hypothesis, mice were treated with either a dose of acetaminophen (600 mg/kg) that produces liver failure or with a dose of acetaminophen (300 mg/kg) that produces liver injury that is fully repaired. In mice treated with 300 mg/kg acetaminophen, levels of proinflammatory cytokines, alanine aminotransferase (ALT), and numbers of proliferating hepatocytes were increased at 24 hours. By 72 hours, cytokines and ALT levels were decreased and the liver was nearly fully repaired. In mice treated with 600 mg/kg, cytokine and ALT levels remained elevated at 72 hours and liver repair failed to occur. In these mice, blood levels of plasminogen were substantially reduced similar to patients suffering from acetaminophen-induced acute liver failure. Collectively, these results demonstrate that blood plasminogen levels are substantially reduced in mice treated with a dose of acetaminophen that produces liver failure. These findings suggest that restoration of plasminogen levels after acetaminophen overdose may restore liver repair and prevent liver failure.

ASSESSMENT OF THE PROTECTIVE EFFECT OF N-ACETYL CYSTEINE IN SPINAL CORD ASTROCYTES DERIVED FROM AMYOTROPHIC LATERAL SCLEROSIS MICE MODEL IN EXPOSURE TO METHYLMERCURY
Ashley Burgos-Sanchez
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 288
Mentor(s): William Atchison

The etiology of motor neuron loss in amyotrophic lateral sclerosis (ALS) is complex. Besides genetic factors, environmental factors could contribute to the onset of symptoms for individuals who are more susceptible to its effects. The environmental neurotoxicant methylmercury (MeHg) may contribute to this neurological disorder. Previous study in our lab in transgenic human SOD1 G93A gene (hSOD1 G93A), an ALS mouse model, indicated a susceptibility to non-toxic level of MeHg. This level of MeHg hastened the disease onset, while the transgenic human wild type SOD1 did not show any adverse effect from this level of exposure. The antioxidant and glutathione precursor compound called N-acetyl cysteine (NAC) with 10mM concentration has shown protective effects to spinal cord astrocytes (SCAs) from 5μM MeHg-induced toxicity. In this study, we used a NAC concentration one-tenth of that used in the previous study. Pre-treatment with 1mM NAC was applied in hSOD1G93A SCA cell cultures 2h prior to exposure to 5μM MeHg. Co-treatment of 1mM NAC and 5μM MeHg were also determined the protection of NAC in this study. The morphology of SCAs was determined after 18h of MeHg exposure using a brightfield microscope. The results showed that 1mM NAC could protect SCAs from MeHg-induced cell degeneration. The synaptic integrities were maintained in NAC with MeHg co-treatment and NAC pretreatment both in hSOD1 G93A and wild type SCAs. These data suggested that MeHg perturbed redox homeostasis in SCAs and the treatment of antioxidant NAC could protect SCA from MeHg- induced toxicity.

NEUROPROTECTIVE EFFECT OF N-ACETYLCYSTEINE ON MOUSE MOTOR-NEURON LIKE CELLS IN METHYLMERCURY-INDUCED TOXICITY
Nicole Marie Camacho Fontánez
Category & Time: Pharmacology & Toxicology, Section 3, 2:30 - 3:45 PM
Poster: 289
Mentor(s): William Atchison

Methylmercury (MeHg), an environmental contaminant, induces toxicity in the central nervous system. Signs and symptoms of MeHg poisoning include paresthesia, dysarthria, cognitive impairment, and cerebellar ataxia. MeHg-toxicity induces oxidative stress in neurons by decreasing antioxidant capacity, such as glutathione (GSH), and increasing reactive oxygen species (ROS) generation which culminates in cell death. N-acetylcysteine (NAC) has antioxidant qualities and is a precursor for GSH synthesis. In this study, we tested the neuroprotective effects of NAC on motor neurons after methylmercury induced oxidative stress using the mouse motor neuron-like cell line (NSC34). NSC34 cells were treated for 2h with 1mM, 10μM, and 100μM NAC before exposure to MeHg. Cell viability was measured every 3h thereafter. To test the neuro-rescue effect of NAC, NSC34 cells were treated with 1mM, 100μM, 10μM, 5μM, 1μM and 0.5μM NAC after 3h of 5μM MeHg exposure. The morphology of NSC34 cells after 18h of 5μM MeHg exposure indicated cell death and loss of synaptic integrity. The 1mM NAC treatment prior to 5μM MeHg preserved neuronal processes and synaptic contacts. The neuro-rescue effect of NAC study indicated that the synaptic contacts and processes of NSC34 cells remained intact in 1mM NAC after 3h of 5μM MeHg treatment. Synaptic integrity and reserve cell viability were also observed in MeHg and NAC co-treatment. These data support the previous studies that MeHg induced increased ROS generation and a reduction of GSH in neurons. NAC could provide neuronal protection and neuro-rescue from MeHg-induced neuronal degeneration.

SYMPATHETIC NEURAL REGULATION OF BLOOD PRESSURE IN MESENTERIC VEINS FROM HIGH FAT DIET-FED MALE AND FEMALE DAHL SALT-SENSITIVE RATS
Rebecca Biltz
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 292
Mentor(s): James Galligan

Sympathetic nerve activity (SNA) is increased in obesity-related hypertension. Increase in SNA reduces mesenteric vein capacitance that moves blood to the heart and resistance arteries. This results in increase in cardiac output, total peripheral resistance and blood pressure. Men are less obese, but more hypertensive compared to age-matched premenopausal women. The venous mechanism of SNA in men and women is not fully understood. We hypothesize that there is sex difference in SNA in the high fat diet-fed Dahl Salt-sensitive (Dahl ss) rats. We will use 17 weeks on diets rats that will randomly be assigned to either control diet (CD, 10 % kcal fat) or high fat diet (HFD, 60 % kcal fat). Mesenteric veins (MV; inner diameter; male=400-525 μm, female=420-520 μm) will be harvested and mounted in a pressure (5-10 mmHg) myograph. Changes in inner diameter will be continuously monitored by video microscopy to an increasing concentration of norepinephrine (NE, 1 nM – 10 μM) as well as ATP (10 nM - 3 mM). Immunohistochemistry for tyrosine hydroxylase (TH) and vesicular nucleotide transporter (VNUT) will be used to mark for NE and ATP, respectively, in the sympathetic nerve fibers in MV tissue.

THE ROLE OF G-PROTEIN SIGNALING REGULATION IN THE DEVELOPMENT OF VASCULAR COGNITIVE IMPAIRMENT AND DEMENTIA
Ting Yen
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 293
Mentor(s): Anne Dorrance

Regulator of G protein signalling 2 (RGS2) has been associated with hypertension and it plays a role in angiotensin II (AngII) signaling, which promotes hypertension development. Studies in our lab show that AngII-hypertensive mice have cognitive dysfunction. We hypothesized that RGS2 deficiency increases blood pressure and is associated with cognitive impairment. We also hypothesize that RGS2 deficiency will be associated with demyelination, a decrease in blood flow, as well as an increase in inflammatory markers as well as a decrease in neuronal support, and synapse formation markers as an associated mechanism for behavioral deficits. Nine-month-old male RGS2 knockout (KO) mice and their RGS2 intact littermate controls were treated with AngII (800ng/kg/min) for 4 weeks to induce hypertension. The RGS2 KO mice have a modest increase in their systolic blood pressure (189±12 mmHg) compared to the RGS2 intact mice (156±11 mmHg); however, these changes were not statistically significant (p=0.076). Cognitive function was assessed using the Barnes Maze test to study spatial memory, and the Novel Object Recognition to test for non-spatial

memory. There was no significant difference in either test between the RGS2 KO and the RGS2 intact controls. Nest building and open field testing, which encompass important survival behaviors, also showed no significant difference. Our results suggest that RGS2 deficient mice are prone to an increase in blood pressure following AngII treatment and RGS2 may play a role in neuroprotective mechanisms in the development of vascular cognitive impairment.

A NOVEL METHOD FOR DETECTING THE PRESENCE OF MICROCYSTIN-LR AND ANATOXIN-A IN FRESHWATER SAMPLES

Gabriel Pastrana
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 294
Mentor(s): John Buchweitz

Cyanobacteria, also known as blue-green algae, are a phylum of bacteria capable of carrying out photosynthesis and they inhabit a wide variety of aquatic ecosystems throughout the world. They are known for producing many different bioactive molecules, some of them highly toxic to animals and humans, these toxins are known as cyanotoxins. The most well-studied and characterized cyanotoxins include microcystin-LR and anatoxin-A. These cyanotoxins can accumulate rapidly in water sources following an algal bloom, which are increasing in frequency and severity due to global climate change and human impact. It is necessary to understand and monitor these algal blooms, because high levels of cyanotoxins can pose a serious health risk to humans and animal populations. The purpose of this study was to develop and validate a new method for microcystin-LR and anatoxin-A detection in freshwater samples through the use of liquid chromatography tandem mass spectrometry (LC-MS/MS) and gas chromatography tandem mass spectrometry (GC-MS/MS), respectively; and to assess inland lakes and ponds around Mid-Michigan for dangerous concentrations of these cyanotoxins. This method will be validated and confirmed through an inter-laboratory comparison with the Michigan Department of Environmental Quality. By developing a novel method for detection of these cyanotoxins the Veterinary Diagnostic Laboratory will be able to assist in the diagnosis of blue-green algae toxicity in animals exposed to tainted waters.

SYNTHESIS AND PURIFICATION OF FATTY ACID EPOXIDE FOR THE USE OF BIOLOGICAL ACTIVITIES

Ruth Anyaeche
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 295
Mentor(s): Kin Sing Lee, Maris Cinelli

Fatty acids are carboxylic acids that contain hydrogen and carbons. The polyunsaturated fatty acids are classified as 'poly' and "unsaturated" because of the presence of multiple double bonds. Studies in our lab focus on omega-3 and omega-6 polyunsaturated fatty acids such as linolenic acid, docosahexaenoic acid, and arachidonic acid. Studies show that epoxide metabolites derived from some fatty acids (via oxidation of the double bonds) can reduce cancer risk, inflammation, hypertension, and tumor growth, while others, such as arachidonic acid epoxides (epoxyeicosatrienoic acids, or EETs) might induce angiogenesis, inflammation and tumor progression. While epoxy fatty acids are easy to synthesize chemically, the disadvantage is that it is difficult to separate the multiple regioisomers formed. Our objective is to synthesize and carefully separate the omega-3 and omega-6 polyunsaturated fatty acids so that we can screen them separately for their biological activity (such as anticancer and antifibrotic activities). We have been using C18 flash and preparative high-performance liquid chromatography to purify epoxy fatty acid regioisomers, which we are then characterizing by Nuclear Magnetic Resonance (NMR) spectroscopy and mass spectrometry. We hope that the techniques we are developing can aid in the study of lipid metabolites.

THE EFFECT OF TRANSFLUTHRIN ON HOST-SEEKING PROCESS OF AEDES AEGYPTI

Latifah Syeh
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 296
Mentor(s): Feng Liu, Ke Dong

Aedes aegypti is the vector for a plethora of diseases including: dengue fever, yellow fever, and zika virus. Over the years these diseases have proven to be dangerous to humanity. Aedes aegypti are closely associated with human dwellings as humans provide blood meals. Heat and human emanation, such as carbon dioxide and chemical odors, signify a potential blood meal for female mosquitoes. They utilize their antennae and maxillary palps to sense potential host based on these cues. Transfluthrin is a low volatile synthetic pyrethroid insecticide which targets on the voltage-gated sodium channel. Field studies also reported spatial repellency of Transfluthrin to mosquitoes. Arm in cage assay is used to determine the effect of exposing Aedes aegypti to sub-lethal concentration of Transfluthrin to determine the

extent in which they can sense the human host after exposure. Effect of Transfluthrin on the olfactory sensory neurons of mosquito antennae will also be determined to correlate the behavioral responses with the physiological changes. This study will help us understand the mechanism of spatial repellency of Transfluthrin in mosquitoes.

DRUG-CYTOKINE SYNERGY ASSAY FOR IDIOSYNCRATIC DRUG-INDUCED LIVER INJURY
Breanna Sellers
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 297
Mentor(s): Holly Mollon

Idiosyncratic drug-induced liver injury (IDILI) is very rare and very little is known about what causes it to occur. Drugs that cause liver failure due to idiosyncratic reactions normally make it through drug testing because IDILI is so rare and drug trials are so limited that the probability of detection is low. The pharmaceutical industry needs a way to be able to screen to see if a drug can cause IDILI in a cell-based model. Recent research has shown that the cytokines tumor necrosis factor-alpha (TNF) and interferon-gamma (IFN) can cause cell death of liver cells due to synergizing with certain drugs known to cause IDILI in people; this synergy is not seen with drugs that do not cause IDILI. This led to the hypothesis that a cytotoxic interaction between cytokines and drugs can be used to detect those drugs that cause IDILI in people. We tested this hypothesis using the liver cell line HepG2/C3A. In these experiments the drug to be evaluated was incubated in the presence and absence of TNF and IFN, and cytotoxicity was determined using the LDH Assay kit, which links the loss of a cell membrane integrity with fluorescence. The procedure was a three-day long experiment in which the first day a plate was seeded with the HepG2/C3A cells, the second day the plate was treated with cytokines and the drug, and the third day the plate was assayed with the LDH Assay kit. The results have shown that diclofenac does not cause IDILI alone but does in the presence of cytokines.

THE ASSOCIATION OF MAST CELL INFILTRATION IN CEREBRAL HYPOPERFUSION
Martina Yen
Category & Time: Pharmacology & Toxicology, Section 4, 2:30 - 3:45 PM
Poster: 298
Mentor(s):

Cerebral hypoperfusion from unilateral carotid artery occlusion has been associated with inflammatory responses. Mast cells, while known for their role in allergic response, are also capable of releasing proinflammatory cytokines. Further, previous studies have shown a link between mast cells and neurodevelopmental disorders associated with inflammation. We hypothesized that cerebral hypoperfusion is associated with an inflammatory response marked by mast cell infiltration and proinflammatory markers. Eighteen-week-old Sprague Dawley rats underwent unilateral carotid artery occlusion (UCAO); sham operated rats served as controls. Immunohistochemistry will be used to assess mast cell infiltration. We expect to see an increase in the number of mast cells present in the UCAO treated group in comparison to the controls. Quantitative RT-PCR will be used to assess the expression of proinflammatory markers such as TNF-alpha and IL-1. Due to the association of cerebral hypoperfusion and inflammation, we also expect to see an increase in expression of proinflammatory markers.

TRANSGLUTAMINASES ARE PRESENT AND ACTIVE IN ADIPOSE TISSUE
Alexis Orr
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 301
Mentor(s): Stephanie Watts

Transglutaminases are a group of enzymes that catalyze a Ca^{2+}- dependent acyl transfer between a g-carboxamine group of a protein-bound glutamine and an amine group. This amine group can be a lysine group in a protein or a free amine donor such as norepinephrine. Previous PCR and immunohistochemistry studies support that adipose tissue expresses transglutaminases TG2 and blood-coagulation Factor XIII mRNA and protein respectively, as well as high concentrations of norepinephrine. Thus we hypothesize that TG2 and FXIII are active in the adipose tissue. The activity of TG2 and FXIII was investigated in tissue sections using T26 and F11KA substrate peptides for TG2 and FXIII respectively and a catalyzing calcium solution. Peptide incorporation was visualized with TRITC fluorescence. Western blot analysis was also used to determine transglutaminase activity in adipose tissue samples, utilizing cystamine to inhibit the experimentally added amine donor 5-(biotinamido)pentylamine. Immunohistochemistry analysis shows that TG2 and FXIII are both active in *ex vivo* rat perivascular adipose tissue of aorta, superior mesenteric artery, mesenteric artery, and brown fat. We have also found, through western analysis, that endogenous biotin is present in high concentrations within brown fats (aortic PVAT and brown fat pad), preventing fluorescent streptavidin secondary to

exclusively bind to experimentally added 5-(biotinamido)pentylamine substrate. Further investigations using avidin blocking may decrease endogenous biotin binding and provide a clearer understanding of the activity of transglutaminases.

THE ROLE OF PIRIN IN FIBROSIS AND SCLERODERMA
Grace Basa
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 302
Mentor(s): Erika Lisabeth

Scleroderma is an autoimmune rheumatic disease that induces fibrosis in the skin and multiple internal organs. It currently affects about 300,000 patients in the United States, especially older women. The pathogenesis of this disease remains unclear which makes it difficult to develop effective treatments for not only this particular disease, but other fibrotic diseases. Our research focuses on the myocardin-related transcription factor/serum response factor (MRTF/SRF) signaling pathway which is downstream of Rho-GTPases and regulated by receptors and pathways involved in the progression of fibrosis. A series of compounds have been created in our lab that inhibit the MRTF/SRF pathway and are successful in reducing pro-fibrotic gene expression. An unbiased mass spectrometry experiment found that a molecular target of these compounds is a transcription factor called pirin. We are investigating the role of pirin in TGF-beta signaling using fibroblasts isolated from pirin knockout mice, which have been generated using Crispr/Cas9 technology. We validated the knockout of pirin by western blots and examined its role in TGF-beta mediated signaling using qPCR. Even though there are no reports of pirin implicating the progression of fibrosis, the connection between pirin and fibrotic genes needs further understanding to explore the potential of new therapeutics.

THE ROLE OF PIRIN IN FIBROSIS AND SCLERODERMA
Grace Basa
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 302
Mentor(s): Richard Neubig

Scleroderma is an autoimmune rheumatic disease that induces fibrosis in the skin and multiple internal organs. It currently affects about 300,000 patients in the United States, especially older women. The pathogenesis of this disease remains unclear which makes it difficult to develop effective treatments for not only this particular disease, but other fibrotic diseases. Our research focuses on the myocardin-related transcription factor/serum response factor (MRTF/SRF) signaling pathway which is downstream of Rho-GTPases and regulated by receptors and pathways involved in the progression of fibrosis. A series of compounds have been created in our lab that inhibit the MRTF/SRF pathway and are successful in reducing pro-fibrotic gene expression. An unbiased mass spectrometry experiment found that a molecular target of these compounds is a transcription factor called pirin. We are investigating the role of pirin in TGF-beta signaling using fibroblasts isolated from pirin knockout mice, which have been generated using Crispr/Cas9 technology. We validated the knockout of pirin by western blots and examined its role in TGF-beta mediated signaling using qPCR. Even though there are no reports of pirin implicating the progression of fibrosis, the connection between pirin and fibrotic genes needs further understanding to explore the potential of new therapeutics.

SCREENING NOVEL REXINOIDS FOR USE IN THE TREATMENT OR PREVENTION OF CANCER
Victoria Boehlert-Somohano
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 303
Mentor(s): Karen Liby

New drugs that are effective for treating or preventing cancer are greatly needed. Selective ligands for retinoid X receptors, known as rexinoids, are significant in cancer because these drugs regulate the growth and survival of cells. For example, bexarotene, an FDA approved rexinoid, as well as LG100268 are extremely effective for the treatment and prevention of breast and lung cancer and increased overall survival rates in preclinical models. LG100268 is more potent than bexarotene. However, both rexinoids share the same negative side effect of elevating triglyceride levels. LG101506 does not cause hypertriglyceridemia, but it is not as potent as LG100268. Therefore, we are synthesizing new rexinoids in order to identify a lead compound that is as effective as LG100268 in its activity and comparable to LG101506 in its side effects. In order to test which compounds elevate triglyceride levels, SREBP, a transcription factor whose activation directly corresponds to increased triglycerides, will be measured. HepG2 liver cancer cells will be treated with 0.3 mM rexinoid; protein levels will be analyzed by western blot and mRNA levels by RT-PCR. In order to test the efficacy of these rexinoids, the suppression of nitric oxide (NO), an inflammatory molecule, will be tested by treating RAW264.7

macrophage-like cells with different concentrations of rexinoids, stimulating with 1 ng/ml of lipopolysaccharide, and measuring NO using the Griess Reaction. The results of these screening assays will guide synthesis of additional rexinoids for future in vitro and in vivo investigations.

NOVEL REXINOIDS INHIBIT NITRIC OXIDE WITHOUT ELEVATING TRIGLYCERIDES
Jessica Moerland
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 304
Mentor(s): Karen Liby

Selective ligands for retinoid X receptors, known as rexinoids, possess anti-cancer properties. Bexarotene, the only FDA-approved rexinoid, is used to treat T-cell lymphoma and has been tested in metastatic breast cancer. Bexarotene and other more potent rexinoids such as LG100268 are highly effective in preclinical models for prevention and treatment of experimental breast and lung cancer. Although LG100268 is more effective than bexarotene, both rexinoids cause adverse side effects, primarily hypertriglyeridemia. The rexinoid LG101506 does not elevate triglycerides but is less efficacious than LG100268 or bexarotene. Our objective is to develop novel rexinoids as potent as LG100268 but that do not cause hypertriglyceridemia. Suppression of the inflammatory mediator nitric oxide (NO) correlates with *in vivo*efficacy for 5 published rexinoids. SREBP is a transcription factor involved in triglyceride synthesis. By measuring relative SREBP mRNA and protein expression in HepG2 cells treated with 0.03 μM drug for 24 hours, we can predict which compounds will elevate triglycerides *in vivo*. Compared to cells treated with a vehicle control or LG101506, treatment with LG100268 and bexarotene elevated SREBP protein levels 2-3-fold and demonstrated significant NO suppression, indicating high efficacy. Screening a series of novel rexinoids revealed compounds with SREBP levels analogous to LG101506 and controls and dose-dependent NO suppression akin to LG100268 and bexarotene. Additional studies confirmed efficacy of the lead compound *in vivo*. Treatment of RAW264.7 cells and HepG2 cells with newly synthesized rexinoids will be used to predict efficacy and safety of additional rexinoids.

TISSUE FACTOR PROCOAGULANT ACTIVITY DUE TO ACETAMINOPHEN OVERDOSE IN THE LIVER
Jade Neverson
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 305
Mentor(s): James Luyendyk

Acetaminophen (APAP) overdose is the most frequent cause of drug-induced liver failure in the United States. APAP overdose causes activation of the blood coagulation cascade. Tissue factor (TF) is a transmembrane receptor and primary initiator of the coagulation cascade. TF is expressed by liver parenchymal cells (hepatocytes) in a complex with its ligand factor VIIa; this complex lacks procoagulant activity in the normal liver. It is known that TF:FVIIa complex expressed by hepatocytes triggers coagulation in APAP-induced liver injury but the mechanisms activating the procoagulant function of this complex are unknown. We tested the hypothesis that treatment of hepatocytes with APAP causes a concentration- and time-dependent increase in TF:factor VIIa complex activity, largely connected to cytotoxicity. Isolated primary mouse hepatocytes were treated with various concentrations of APAP (0-5 mM) for various times (0-18 hours). APAP caused concentration-dependent cytotoxicity as indicated by release of alanine aminotransferase (ALT) into the culture medium. Surprisingly, in preliminary studies we found that cytotoxicity was insufficient to elicit an increase in TF procoagulant activity. Only high concentrations of acetaminophen (5 mM) increased TF procoagulant activity, indicated by increase in coagulation factor Xa activity in a two-stage assay of TF procoagulant function. The results suggest a potential disconnect between the mechanisms of APAP-induced TF procoagulant function and cytotoxicity.

PIEZO 1 IN THE PERIVASCULAR ADIPOSE TISSUE, TRANSLATION AND STRESS
Marie Negroncamacho
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 306
Mentor(s): Stephanie Watts

Adipose tissues including brown and white are known for their functions of energy storage, structure support and thermoregulation. Over the past 10 years adipose tissues has been revealed to be dynamic endocrine tissue. In particular, perivascular adipose tissue (PVAT) is the fat directly outside the vascular wall. A standing question is how changes in vascular pressure are transmitted to PVAT. Piezo 1 is a non-selective stretch-activated ion channel expressed in the endothelial cells of developing blood vessels. We hypothesize that the Piezo 1 channels are present in the PVAT and actively modify vascular tone. Immunohistochemistry was used to identify the presence of Piezo 1 in PVAT of rat

thoracic aorta. Sections of thoracic aorta plus PVAT were incubated with and without primary antibody against Piezo 1 overnight. FITC- labeled secondary antibody was used to visualize Piezo 1. Slides were imaged with an inverted microscope and nuclei were counterstained with DAPI. Piezo 1 could be located in the endothelium, smooth muscle and more variably in PVAT (n=5 different rats). Future directions include a contractility study with Yoda (Piezo 1 channel activator) in the vessels with or without PVAT to determine if Piezo 1 in the fat affect the contractility of the vessel. This study will unfold or uncover more questions about PVAT and how it is connected to and impacts its neighboring vessel.

FIGHTING OBESITY WITH THE BRAIN: ACTIVATION OF DOPAMINERGIC NEUROTENSIN RECEPTOR-1 NEURONS IN THE VENTRAL TEGMENTAL AREA

Jillian Matasovsky
Category & Time: Pharmacology & Toxicology, Section 5, 2:30 - 3:45 PM
Poster: 307
Mentor(s): Gina Leinninger

Diet and exercise are the most prescribed treatment for obesity, but are difficult to maintain, so most individuals regain weight. Pharmacologic strategies to suppress feeding and promote physical activity would be useful to reverse the obesity epidemic. Since dopamine (DA) neurons in the Ventral Tegmental Area (VTA) can increase or decrease feeding and physical activity behaviors, we reasoned that there might be a group of VTA DA neurons supporting dual weight loss behaviors. Indeed, our lab identified a specific subset of VTA DA neurons that express neurotensin receptor-1 (NtsR1). Our long-term goal is to define the roles of VTA NtsR1 neurons and whether they can suppress feeding and promote activity to reduce body weight. To reach this goal, we will express excitatory Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) in VTA NtsR1 neurons, allowing us to activate the neurons in vivo by treating with the DREADD-ligand clozapine-N-oxide (CNO). First, we confirmed whether DREADD expressing VTA NtsR1 neurons can be activated by assessing cFos (a marker of depolarized neurons) in the VTA of Vehicle or CNO treated mice. CNO treatment increased the amount of cFos specifically in VTA NtsR1 neurons compared to vehicle. These data confirm that we can use DREADDs to activate VTA NtsR1 neurons, and going forward we will use this technique to activate VTA NtsR1 neurons in vivo to determine how this specific population of neurons contributes to energy balance.

PHYSICAL & MATHEMATICAL SCIENCES

CHARACTERIZATION OF FEMIUM 290

Matthew O'Neal
Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 310
Mentor(s): Samuel Giuliani, Witold Nazarewicz

Our planet has a large amount of elements that are too heavy to have formed in our sun. By learning about how these heavy elements formed we might be able to gather information about the early universe. It is suspected that these trans-uranic elements formed through the decay of nuclei formed through the rapid neutron capture process (r-process). The goal of this study is to compute the lifetime of decay (half-life) of Fermium 290 (^{290}Fm). In this study, the half-life of ^{290}Fm will be found by determining the penetration probability of the nucleus through a potential barrier defined in a space of collective shape coordinates. These calculations are performed within the framework of self-consistent density functional theory. The half-life we compute can be used in r-process network calculations.

TOPOLOGICAL DATA ANALYSIS OF NATURAL IMAGES

Paul Soma
Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 311

This research focuses on applying topological data analysis methods to natural phenomena. One dataset we examine is the space of natural images, meaning grayscale photos taken in nature. More specifically, the space of high-contrast n-by-n pixel patches. It has been shown in previous research that the most relevant portions of this space make up a surface with the topology of the Klein bottle. We will use a multiscale method (akin to zooming in and out) to enlarge this space.

PERPENDICULARLY MAGNETIZED FERROMAGNETS FOR CRYOGENIC MEMORY
Anna Osella
Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 312
Mentor(s): Norman Birge

When a thin enough non-superconducting material is placed between two superconductors, a supercurrent can still pass between them. This device, called a Josephson Junction, can be used as part of a memory cell in superconducting supercomputers. If the non-superconducting material is a ferromagnet, a phase shift can be picked up between the electron waves coming into the first and out of the second superconductor, depending on the thickness of the ferromagnet. We are able to control this shift by inserting a second ferromagnet that can switch between magnetizing parallel or antiparallel to the first, acting as an extension of the first or cancelling out its effects. This phase difference can then be read as a zero or one and used for memory storage. If a third ferromagnet is added between them, with its magnetization perpendicular to the magnetizations of the other two, then a new type of supercurrent can pass through the junction with the advantage that its behavior is less dependent on the thicknesses of the magnetic layers. We are looking into ways to make the third magnetic layer with natural out-of-plane magnetization. We will report on the magnetic properties of palladium-cobalt and gold-cobalt thin film multilayers with the goal to optimize our Josephson junction memory devices.

INVESTIGATING STUDENTS ABILITY TO CREATE INTERDISCIPLINARY CONNECTIONS: ENTROPY TO OSMOSIS
Brianna Martinez
Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 313
Mentor(s): Rebecca Matz

Students in undergraduate biology courses often struggle to realize the interdisciplinary nature of biology concepts and connect the core underlying chemistry content to the biological phenomena. Part of the difficulty for students is that current undergraduate biology assessments encourage memorization and assess students' ability to recall facts, lacking the opportunity to make connections. To address this problem, biology faculty at two different universities were surveyed to identify which scientific practices, crosscutting concepts, and disciplinary core ideas are most valued such as protein function, electrostatics of side chains and membranes, osmosis, and entropy. Following the results of this survey, an assessment task was developed to investigate how students connect the concept of entropy to osmosis. The assessment task was a series of questions first asking students to think about the biology content, then giving them the opportunity make the connection between the chemistry concept and biological phenomena, then asking them explicitly about the chemistry content and finally again giving them the opportunity to make the connection between the chemistry and biology. The assessment was administered through an online platform to undergraduate students across the two universities. The responses were categorized and the data analyzed to investigate students ability to correctly apply the concept of entropy to osmosis.

GEANT4 SIMULATION OF LHE TPC THGEM BASED TARGET
Angel Christopher
Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 314
Mentor(s): Paul Gueye, Thomas Baumann

A collaboration of 11 institutions (10 primary undergraduate institutions and one Historically Black institution), called the MoNA Collaboration, has been involved at NSCL for almost two decades. Hampton University, which joined the collaboration in 2013, has lead the development of a Si-Be segmented target that was used to measure the lifetime of 26O in the summer 2016 and neutron unbound states in the island of inversion in the Fall 2017, both using the invariant mass technique. This target provided for the first time detail information about the incident beam position and energy before and after exiting the Be targets to within 10%. A proposal to construct a GEM-based version of this target, a dual-phase liquid helium time-projection chamber (LHe-TPC), was adopted by the MoNA Collaboration in 2016 to increase the position and energy resolutions, and allow missing mass reconstruction by detecting the recoil fragments. To assess its performances, a realistic Geant4 based Monte Carlo simulation is being developed that also includes a 3D map of the electric field (from the Garfield software). Results from this simulation will be presented and compared to experimental data for the standard gas electron multiplier (GEM) detectors. The availability of the thick GEM technology developed by MSU is more suited for heavy ion experiments. We will also present preliminary expected performances of this proposed LHe-TPC TH-GEM based target. This work is partly supported by NSF award #1713589.

DECODING HOW PHYSICS STUDENTS ENGAGE IN COMPUTATIONAL PROBLEM-SOLVING PRACTICES IN P-CUBED

Daniel Oleynik

Category & Time: Physical & Mathematical Sciences, Section 1, 2:30 - 3:45 PM
Poster: 315
Mentor(s): Marcos Caballero, Paul Irving

At the introductory level at MSU, we have designed a problem-based learning environment called P-Cubed, which is aimed at teaching student skills that will prepare them for both future classes and future careers. Within this classroom, a focus is put on how physics and engineering students work with minimally working programs in a group problem-solving framework. It's currently known that students in individual environments will use different frameworks and strategies to solve the problem. However, literature fails to explain computational problem solving in group environments. This research project looks at students within these group environments and analyzes in-depth the approaches that they're taking. This research project looks at multiple examples of in-class data with different groups of students working on the same problem, a 2-dimensional physics question which asks students to work with forces and momentum to achieve their goal. With this in-depth analysis, we hope to discern whether there are large similarities between the problem-solving strategies of different groups in the classroom.

CHARACTERIZING THE VOLTAMMETRIC RESPONSE AND CAPACITANCE OF DIAMOND THIN-FILM ELECTRODES OF DIFFERENT MICROSTRUCTURE AND MORPHOLOGY

Karis Barnett

Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 319
Mentor(s): Greg Swain

Understanding how the capacitance (F/g or F/cm^2) can be maximized for a material is important when considering materials used in electric double-layer capacitors, which are typically used as energy storage devices. Boron-doped diamond (BDD) thin-film (ultrananocrystalline, nanocrystalline, microcrystalline) electrodes were investigated in this work. The films were prepared with different microstructures and morphologies by adjustments in the source gas composition used in the chemical vapor deposition process. The films were utilized for a two-phase project. In the first phase of the project, the background voltammetric currents of the different electrodes were recorded in two electrolyte solutions, 0.1 M H2SO4 and 0.1 M NaOH, as a function of the potential scan rate. The current-scan rate relationship was used to determine electrode capacitance (F/cm^2). The potential dependent capacitance was also determined using electrochemical impedance spectroscopy in the same two supporting electrolytes. In the second phase of the project, cyclic voltammetry was used to evaluate the different electrode responses for dopamine, catechol, and 3,4-dihydroxyphenyl acetic acid (DOPAC) in a 0.1 M phosphate buffer (pH 7.2) to determine electrochemical activity for heterogeneous electron-transfer. The capacitance of each electrode was correlated with their electron-transfer activity. Raman spectroscopy was used to characterize the diamond film microstructure and atomic force microscopy was used to assess the film morphology.

ROTATIONAL DIFFUSION DYNAMICS OF OXAZINE 725 IN A BINARY SOLVENT SYSTEM. IN SEARCH OF HETEROGENEITY IN THE SOLUTION PHASE

Austin Benedict

Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 320
Mentor(s): Gary Blanchard

Oxazine 725 is a laser dye that is used in this work to understand whether or not two liquids mix randomly or exhibit molecular scale heterogeneity. By studying the rotational diffusion behavior of this dye in a binary solvent system, comprised of a polar aprotic solvent (DMSO) which is not capable of hydrogen bonding, and controlled amounts of a polar protic solvent (1-propanol) that is capable of hydrogen bonding, we will determine the uniformity of the solvent system at the molecular scale. The Oxazine 725 rotational dynamics will exhibit a linear dependence on the concentration of 1-propanol if the solution is homogeneous and a non-linear trend if the solution is heterogeneous. The results of this work have implications on chemical processes ranging from chemical separations to the synthesis of complex pharmaceutical compounds.

FITTING TURBULENT AND CONVECTIVE PARAMETERS IN ONE-DIMENSIONAL CORE-COLLAPSE SUPERNOVA SIMULATIONS
Theo Cooper
Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 321
Mentor(s): Sean Couch

Core-collapse supernovae (CCSNe) are the explosive deaths of massive stars. While CCSNe are crucial to many aspects of our understanding of the universe, including the synthesis of the elements, the physical mechanism that drives these explosions is not fully understood. While three-dimensional simulations of core-collapse supernovae are the most physically accurate representation of the real phenomenon, they use a notorious amount of computing power. 1D simulations are less demanding but fail to reproduce many of the physical effects of 3D calculations. We explore a new model for including convection and turbulence in 1D simulations that mimics 3D simulations in a realistic manner. Our model requires fitting model parameters to 3D simulation data. By including the proper coefficients of turbulent diffusion and convective mixing length in our model, 1D simulations can be executed in a way that reproduces the results of 3D simulations. If successful, this method could potentially save valuable computing time and allow for fast, accurate testing of future hypotheses. In this study, we construct a Gaussian Process Emulator of the parameter space and use Markov Chain Monte Carlo (MCMC) methods to find optimal values for the mixing-length coefficient $\alpha\Lambda$ and diffusion coefficient αD. Once $\alpha\Lambda$ and αD are found empirically, they will be used to close the model equations governing the turbulent dynamics in 1D simulations of CCSNe during the period immediately following the core bounce.

AN EXTRAPOLATION MODEL FOR PREDICTING QUANTUM ENERGIES OF LARGE SYSTEMS
Nikhil Shankar
Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 322
Mentor(s): Matthew Hirn, Yue Qi

Determining quantum chemical properties of a molecular system via density functional theory (DFT), although accurate, is computationally expensive and severely limited by the size of the system in question. Machine learning methods are becoming popular as, in certain cases, they maintain state of the art accuracy while offering substantial savings in computer time. However, these methods require extensive data sets of DFT calculations, have difficulty extrapolating beyond training examples, and are difficult to interpret. We present a machine learning model that trains on small molecular systems, and then predicts the quantum chemical energy of larger systems by learning parameters to model the underlying physical relationships common to the different sizes. Specifically, we attempt to model the varying electronic interactions and behaviors over a range of length scales. To accomplish this, we create a surrogate electronic density based on the atomic positions, which we use to compute multi-scale invariants of the system. These invariants are determined using wavelets inspired by electron orbitals, and they lead to a representation of the system that is unaffected by atom re-indexing and isometric transformations, in addition to varying regularly under system deformations. Performing a multilinear regression on these invariant wavelet scattering coefficients produces an algorithm that is capable of generalizing beyond its training examples in a relatively interpretable manner.

IMPROVING ICECUBE NEUTRINO RECONSTRUCTION SOFTWARE
Emma Hettinger
Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 323
Mentor(s): Tyce DeYoung

Neutrinos are particles that rarely interact with anything, which means that they can travel to earth from distant galaxies. IceCube is a neutrino detector located at the South Pole. Its purposes are to find where cosmic rays come from, search for dark matter, and characterize neutrino properties. It can't detect neutrinos themselves, so it detects light emitted from particles that neutrinos interact with. This light creates a pattern, and reconstruction software uses this pattern to determine information about the event, such as the direction and energy of the neutrino. The goal of this project is to optimize numerical methods to improve the reconstruction software.

NITROAROMATIC-DETECTING CADMIUM COORDINATION POLYMERS WITH UNPRECEDENTED 2D AND 3D TOPOLOGIES
Andrew LaDuca
Category & Time: Physical & Mathematical Sciences, Section 2, 2:30 - 3:45 PM
Poster: 324

A series of Cadmium containing coordination polymers were created with 4BPMP. bis(4-pyridylmethyl)piperazine, and Cyclohexyldicarboxylate co-ligands. Each compound was analyzed via X-ray diffractometry to obtain crystal structures and topologies. Additionally, all compounds show significant explosive nitroaromatic detection properties.

ISOLATION OF CU-70 ISOMERS USING A PENNING TRAP
Nelly Jerop
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 327
Mentor(s): Ryan Ringle

Rare isotopes are produced via projectile fragmentation of stable, relativistic primary beams from the cyclotron installed at the National Superconducting Cyclotron Laboratory (NSCL) located at Michigan State University. There are many properties of these rare isotopes that are important to study such as beta decay. Using the low energy beam and ion trapping (LEBIT) 9.4T penning trap spectrometer, the beta decay of 70Cu will be measured using the Summing NaI detector (SuN). The decay of 70Cu is a prime candidate for measuring the beta decay from an isomeric state (long lived excited state) to the ground state of the daughter nucleus. There are three beta-decaying states in 70Cu; the ground state with $J\pi$ = 6- (spin and parity), the 101-keV state ($J\pi$ = 3-), and the 242-keV state ($J\pi$ = 1+) [Vin2010]. The three isomeric states have half-lives 44, 33, and 6.6 seconds, respectively. The resolution of SuN requires that only one isomer of 70Cu be measured at a time. The LEBIT trap can selectively clean masses, however it is not yet known if it is possible to simultaneously clean the isomers of 70Cu. We tested LEBIT capabilities by checking the effect of cleaning on count rate of 39K and found 50% transmission efficiency of target isomers and 92% cleaning efficiency of contaminants with cleaning time of 750ms and for 85Rb we found preliminary results to be corrected. This should meet the requirements on the SuN detector to allow the Cu-70 experiment as planned.

AN OPTICAL AND RADIO SEARCH FOR ASTROPHYSICAL TRANSIENTS
Christina Conner
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 328
Mentor(s): Laura Chomiuk

The overall goal for our study is gaining an understanding of explosions and other transients in the time-domain universe. We are accomplishing this by doing a joint look into the deep radio and optical monitoring. I will be presenting my early results of the optical time-domain study.

IMPACT OF STUDENT REPRESENTATION CHOICES ON THEIR SUCCESS IN INTRODUCTORY PHYSICS
Darcy Maestrales
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 329

This research project was designed to better understand the tools that students taking introductory physics courses choose on the problems they are learning to solve and how those representations correlate to student success. In the University Modeling Instruction – Electricity and Magnetism course at Florida International University, students were given a survey before and after the course, which asked students to choose which representations they would use to solve a variety of problems. From the survey responses, we created a co-occurance network that showed ties between the representations that were chosen together on each survey question. The networks were then examined to see which representations were relied on by students, which representations were used together in pairs or groups, and which categories of representations were used to solve specific types of problems. These response networks were also examined for differences before and after taking the course as well as how they were related to the students' success in the course.

THE IMPACT OF CURRICULUM CHANGE IN INTRODUCTORY CHEMISTRY COURSES ON FUTURE STUDENT PERFORMANCE
Matthew Ring
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 330
Mentor(s): Marcos Caballero

Understanding the impact of curricula change on all students is a key component to understanding student retention and learning in STEM degree programs. Introductory chemistry courses at university are many of these students' first encounter with STEM courses beyond high school. In 2013 Michigan State University began reforming the introductory chemistry sequence for non-majors titled Chemistry, Life, the Universe, and Everything (CLUE). CLUE curriculum has demonstrated positive impacts on learning for students relative to the traditional course offerings. However, these effects have not been investigated beyond CLUE nor have the results been disaggregated by student background and demographics. Although, grading practices differed between sections in the reformed and traditional curriculum, preliminary results show that there is a statistically significant difference between grade distributions for CLUE and traditional curriculum introductory chemistry courses and that these differences depend on student demographics. Moreover, students who transition from CLUE to traditional curriculum during the introductory chemistry sequence perform worse in the second semester of introductory chemistry than students who only take traditional curriculum introductory chemistry courses.

DETERMINING MATERIAL THICKNESS USING AN ALPHA-EMITTER SOURCE
Mira Ghazali
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 331
Mentor(s): Daniele Dell'Aquila, Man-Yee Tsang

Semiconducting materials, like silicon, are widely used in nuclear physics to detect charged particles emitted in nuclear collisions. In a recent experiment at the National Superconducting Cyclotron Laboratory (NSCL) at MSU, we used an array of 12 telescopes each of which contains a position sensitive Si detectors of area 6.5 cm x 6.5 cm to study the collisions of high energy calcium ions on a thin tin foil. In the collision we studied, low energy electrons were produced copiously. We used thin Tin/Lead foils to protect the detectors from noise generated from these electrons. The thickness and uniformity of the foils exceeds the accuracy provided by the manufacturer. We will discuss how the thicknesses of these thin foils can be indirectly be measured with an alpha-emitter source. We will also examine the energy calibration of silicon detectors using the same source. Accurate information on both the foil thickness and energy calibration of the detector is needed in order to analyze the experiment data correctly.

EVALUATING THE EFFECT OF COURSE TRANSFER CREDIT ON TIME-TO-DEGREE IN UNDERGRADUATES
Alyssa Waterson
Category & Time: Physical & Mathematical Sciences, Section 3, 2:30 - 3:45 PM
Poster: 332
Mentor(s): Marcos Caballero

Earning a bachelor's degree is expensive and time-consuming. Many students pursue Advanced placement credits in high school or transfer coursework from other degree-granting institutions, but the effect of those transfer credits on the latter of these two on time-to-degree is currently not well understood. In this work, we investigate how different features (e.g., students' majors, gender, ethnicity, average grade) impact time-to-degree. We have identified three subsets of graduated students: those with any transfer credits, those with transfer credits only from high school, and those without transfer credits. Preliminary results suggest that students majoring in STEM often graduate later than four years if they do not have transfer credits. Students with both Advanced Placement and other institution transfer credits often graduate within four years or before. This research explores the differences between the transfer student categories and compares STEM with Non-STEM graduates.

MECHANISTIC STUDY OF ELECTROCATALYTIC UPGRADING OF LIGNIN AND NON-LIGNIN MONOMERS TO BIOFUELS AND USEFUL CHEMICALS RESPECTIVELY
Christopher Mcallister
Category & Time: Physical & Mathematical Sciences, Section 4, 2:30 - 3:45 PM
Poster: 334
Mentor(s): Benjamin Appiagyei, James Jackson

Electrocatalytic hydrogenation (ECH) provides a new approach for upgrading bio-oil to biofuel. Bio-oil, liquid product from biomass pyrolysis, can be reductively stabilized with ECH using a Raney™ Nickel cathode under very mild conditions (75 °C, 1 atm, H_2O as electrolyte). A general concern of this method is the complex mixture of monomers and dimers in bio-oil readily undergo acid or base catalyzed polymerization, especially upon heating. An understanding of monomer-dimer interactions is essential to success for increasing reaction scale. Our research aims to address this concern by exploring the mechanism of the electrocatalytic hydrogenation process by building on Dr. Jason Lam's study[1] of ECH of guaiacol (2-methoxyphenol) isomers. He found that reactivity appeared to track with proximity between the methoxy group (hydrogen bonding acceptor) and the hydroxy group (hydrogen bonding donor) on the same molecule; we envisage to explore hydrogen bonding effects as a factor for reactivity. In this work, we have also adopted models that resembles lignin monomer, anisidines (the three isomers of methoxyaniline). Measurements of reaction rates and selectivity as a function of concentration are being used to study the effects of hydrogen bonding within and between substrate molecules, ideally determining whether the presence of one species can activate or inhibit the catalyst in reduction of another.

FLUORESCENCE IN NEUTRAL AND ANIONIC COUMARINS
Hunter Pham
Category & Time: Physical & Mathematical Sciences, Section 4, 2:30 - 3:45 PM
Poster: 335

Coumarins are naturally found in a variety of plants and plant products; some are especially known for being fluorescent compounds, oftentimes changing in fluorescent characteristics in solutions with varied pH. This project involves inducing neutral or anionic compounds through the use of tetrahydrofuran as a solvent and sodium metal as an irreversible base. Absorption and emission spectra are compared across eight coumarins and their anionic counterparts and lifetime measurements are made to compare solvent effects on the molecules fluorescence. Substituent effects on fluorescence are compared among 6- and 7-substituted coumarins, including umbelliferone, 6-hydroxycoumarin, aesculetin, herniarin, scoparone, scopoletin, isoscopoletin, and unsubstituted coumarin. Spectra and substituent effects are compared to computational model predictions made through Gaussian 09.

EFFECTS OF INPUT NUCLEAR PHYSICS ON CORE COLLAPSE SUPERNOVA SIMULATIONS
Brandon Barker
Category & Time: Physical & Mathematical Sciences, Section 4, 2:30 - 3:45 PM
Poster: 336
Mentor(s): Sean Couch

In the proto-neutron star formed during a core collapse supernova (CCSN), densities can reach several times nuclear density. Due to uncertainties in nuclear physics, there are several different physical models for the equation of state (EOS) at the densities present in the CCSN environment. The outcomes of CCSN simulations can depend sensitively on the EOS. 1D CCSN simulations are key in predictions of the outcome of stellar evolution, neutron star mass distribution, nucleosynthesis, and ultimately, galactic evolution. However, uncertainties in nuclear physics causes changes in these results: simulations using different EOS tables can lead to entirely different predictions. We explore the sensitivity of CCSNe to variations in input nuclear physics. Using 10 different EOS models, we ran 1D CCSN simulations with progenitor masses ranging form $9M_ø$ to $120M_ø$ using a new model for driving 1D explosions that includes the crucial effects of turbulence and convection. Some results. A quantitative understanding of how different EOS tables affect the outcome of core collapse is crucial to our ability to make predictions.

DEVELOPMENT OF AN ORGANIC CATALYST FOR LIGNIN VALORIZATION

Caleb Geissler
Category & Time: Physical & Mathematical Sciences, Section 4, 2:30 - 3:45 PM
Poster: 337
Mentor(s): Eric Hegg, James Jackson

Lignin, a complex polymer found in the cell wall of plants, shows promise as a renewable source of fuels and specialty chemicals. For this potential to be realized, a simple, mild, and cost effective method for depolymerizing lignin must be devised. Our lab has shown that small organic thiols, β-mercaptoethanol and dithiothreitol, can reductively cleave the most common type of linkage in lignin, the β-O-4 bond, by mimicking an enzymatic pathway for β-O-4 cleavage. The first step is a nucleophilic cleavage of the ether bond, creating a thioether. Reduction of the thioether with a second thiol results in complete dimer cleavage and disulfide release. To make this process sustainable, the thiol must be regenerated by reducing the disulfide to its monomeric form. Electrochemical reduction of disulfides into thiols has been demonstrated industrially, and herein we describe selective reduction of the oxidized thiol mediator, enabling multiple ether cleavage reactions. The optimal parameters to reduce the disulfide were determined, then applied to the β-O-4 reaction to demonstrate the complete organocatalytic cycle of β-O-4 cleavage.

USING TOPOLOGICAL DATA ANALYSIS TO TEST ORDERED SPIKE PATTERNS IN NEUROLOGICAL DATA

Kayla Makela
Category & Time: Physical & Mathematical Sciences, Section 4, 2:30 - 3:45 PM
Poster: 338
Mentor(s): Elizabeth Munch

Neuroscience is currently undergoing an unprecedented surge in the amount of data available and the current forms of analysis fail to grasp the complexity of this data. Graph theory, a way of viewing and analyzing relationships between neurons based on determining whether each pair of neurons meets the connection criteria (i.e. the distance between the data points falls within a set threshold), falls short of expressing higher-dimensional concurrences. Topological data analysis is an expansion of this field wherein we can study connections between more than two neurons at a time and study how those connections compound upon each other in higher dimensions. In this project, data consists of neural spike data taken from a rodent running around a circular platform with markers on the edges to tell the rat where to go. The data is converted into a simplicial complex that takes into account order of firing and number of times that order occurs. This complex is passed through persistent homology code libraries in order to observe how the neurons interact with each other. This can be used to predict the rodent behavior based on the spike data, as well as to identify relevant neurons related to learning.

SOCIAL SCIENCES

GENTRIFICATION AND FOOD DESERTS IN METROPOLITAN DETROIT

Samrawit Fesshaie
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 341
Mentor(s): Joe Darden

The lack of commercial establishments selling fresh fruits and vegetables in certain neighborhoods called “food deserts” are a problem that affects 23.5 million people in the United States. Studies have shown that of those 23.5 million people, 50% of them are classified as low income. Previous research shows that the poverty levels of a neighborhood have been associated with the location of a food desert, therefore the question for investigation is whether the process of gentrification changes such neighborhoods which then leads to a reduction of food deserts. Gentrification in this specific study is defined as the process by which the neighborhood is economically upgraded by developers via the rehabilitation of housing resulting in increased in-movement of middle income residents. The objectives of this paper are to determine whether neighborhoods that are gentrified are different than neighborhoods that are not gentrified in their access to fresh fruits and vegetables versus their access to unhealthy food sources such as fast food businesses. It is hypothesized that gentrified neighborhoods will have fewer food deserts and thereby provide more establishments selling healthier food and less selling fast food. Detroit is the location of this case study. The study’s data will be obtained from the U.S. Bureau of the Census American Community Survey Five Year Estimate 2011-2015 and directories of food establishments. The data will be analyzed using the Darden-Kamel Composite Socioeconomic Index as well as the Index of Dissimilarity. The composite socioeconomic index will enable gentrified neighborhoods to be clearly

distinguished from non-gentrified ones by census tracts while the Index of Dissimilarity will provide the spatial distribution of two population groups. The addresses of food establishments will be located by census tracts using the U.S. Bureau of the Census Geocoder This is the first study to examine the influence of gentrification on food deserts using such methods. The results will have societal and political implications for city officials and residents living in food deserts. The expected result is that: (1) there will be a higher prevalence of fast food options in non gentrified neighborhoods than gentrified neighborhoods. The findings will be generalizable for other cities where food deserts exist and the process of gentrification is occurring.

CARTER G. WOODSON AND THE QUEST TO DISRUPT THE HEGEMONIC EPISTEMOLOGY AND PRODUCTION OF PUBLIC KNOWLEDGE SURROUNDING BLACK HISTORY
Gloria Ashaolu
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 342
Mentor(s): Terah Venzant Chambers

For almost forty decades Dr. Carter G. Woodson tirelessly invested his time and effort in advocating for the recognition of Black cultural achievement. Through the examination of the programs and movements he launched, I analyze Woodson and his protégée's pragmatic approach between 1915 and 1950 to disrupt the hegemonic epistemology and production of public knowledge surrounding Black History. This paper comprises of why Dr. Woodson's believed why this work was vital to uplifting the Black race and the mediums he used to reimagine Black contribution in the U.S. Dr. Woodson's pedagogy of reaching the masses manifested through the Association for Study of Negro Life and History; Black History Week, the Negro History Bulletin, and the publications of books that targeted the proletariat. It is my intent to focus the bulk of this paper on the latter,-- specifically using the book, *The Child's Story of the Negro* by Jane Shackelford, published by Dr. Woodson's Associated Publishers Inc. My approach to answering this question is using archival work produced or published by Dr. Woodson. The following are the primary document I will be examining: *The Miseducation of the Negro, The Child's Story of the Negro, and Negro History Bulletin,*and etc. Dr. Woodson was more than just a theorist. The focus on the materialization of his efforts and how they informed and sustained many African-Americans also seeks to break free of the minimum credit Shackelford's book and, overall, women receive for their effort and dedication to the accurate representation of Black History.

DO PITCH CHARACTERISTICS INFLUENCE TEMPO DETERMINATION?
Audrey Drotos
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 343
Mentor(s): J McAuley, Leigh VanHandel

Research in the field of music cognition has found that various factors influence listeners' perception of the musical tempo. Those factors include listeners' preferred tempo (McAuley, Jones, Holub, Johnston, & Miller, 2006) and level of physiological arousal (Jakubowski, Halpern, Grierson, & Stewart, 2015). There is also some support that pitch characteristics of short musical sequences influence listeners perception of how fast or slow music unfolds in time. In general, melodies with more pitch change are perceived to unfold more slowly in time than melodies with less pitch change (Boltz, 1998). This study investigated whether pitch characteristics also provide contextual cues for determining the most appropriate (best) tempo for unfamiliar music. In two experiments, participants listened to continuous (looped) presentations of unfamiliar isochronous melodies and adjusted tempo in real time until they determined the appropriate tempo for each melody. Final chosen tempos were generally slower for melodies with a larger pitch range, more contour changes (i.e., changes from ascending to descending pitch trajectory), and those with larger (and greater numbers of) pitch skips/leaps. Examination of continuous tempo tracking data for each melody revealed a range of different strategies that participants used to determine the appropriate tempo. Across the different strategies, however, it took longer (more beats and more melody repetitions listened to) for participants to decide on an appropriate final tempo when the melody contained fewer pitch changes. Results support the view that pitch characteristics provide non-temporal information that affects participants decisions about the appropriate tempo for an excerpt of music.

EXAMINING THE SOCIAL AND STRUCTURAL DETERMINANTS OF TRAUMA, DEPRESSION AND SUICIDALITY IN AFRICAN AMERICAN CHILDREN AND ADOLESCENTS
Tusani Gates
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 344
Mentor(s): Kaston Anderson-Carpenter

Per a study conducted by the CDC in 2014, suicide is the third leading cause of death for African American males and females between the ages of 15-19, behind homicide and unintentional injury. The incidence of suicide has been increasing dramatically in recent years; a new study published in a journal for JAMA Pediatrics highlighted the finding that suicide rates for African American children between the ages of 5-12 is twice as high as the rate for Caucasian children in the same age-group. This racial discrepancy is a call to action for more research examine the specific risk factors that are affecting the African American children and adolescents; because 90% of suicide victims are of Caucasian descent, a large amount of previous research focused on this general population. We propose that studying longitudinal data from African American children, aged 5 to 19, will provide insight into the social and structural determinants of factors that lead to suicidality. We hypothesize that the associations between culture, exposure to violence, trauma, depression, socioeconomic status and racism have a significant influence on African American child and adolescent suicidality. We will perform a confirmatory factor analysis that will highlight factors that group together and lead to suicidality, in addition to a structural equation model will illustrate the dynamics of the relationship(s). We anticipate that each factor will have an influence on overall suicidality, but certain factors group together will show a higher level of significance compared to other groupings or singular factors. Our results will lay the foundation for a theoretical model explaining the risk factors that influence African American child and adolescent suicidality, opening the door for clinical and community preventative measures.

WHY SHOULD WE CARE ABOUT PRIMARY ELECTION WEBSITES?
JoVontae Butts
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 346
Mentor(s): Eric Juenke

Citizens of different races and ethnicities are bound to have different experiences as well as different perspectives on social issues. There is very little research literature available on the topic of candidates of color and what those candidates had to offer to society if/when elected into office. Due to the lack of research on election losers, the different perspectives and resolutions to social issues are often overlooked. The under-representation of Black, Latino, Asian, and North African. We do not usually differentiate candidates in this way in the literature. Focus on the major categories: Black, Latino, and Asian.

STATE LEVEL RESPONSES TO DISTRESSED CITIES: DOES RACE MATTER?
LaMia Cotton
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 347
Mentor(s): Joshua Sapotichne

In the United States, 20 states have policies that allow them to intervene in or take over financially troubled local governments. This research explores the criteria the State of Michigan uses to declare a district as failing and the role perceptions of a district and its student population play in the takeover decision. Using an exploratory comparative analysis of the Detroit and Pontiac Public School Districts, the project investigates where the criteria the State of Michigan uses to define a failing school is more subjective than objective and where interventions on low performing schools are linked to racial biases. Both districts have similar characteristics in school and student performance, but ultimately have different outcomes when it comes to State intervention. It is important to acknowledge and establish the relationship between perceptions and why certain school districts are taken over. Findings show that State Government interventions increasing fiscal stability, there is still a gap between State and Local Legislatures ability to cohesively increase academic performance and educational outcomes in low-performing schools. In conducting a case study we will use a mixed methods approach using qualitative content analysis of newspaper articles about both school districts and a quantitative descriptive analysis to compare the school districts on variables of interest such as academic outcomes and school budget. Lastly, we anticipate that the results of this research will shift focus to the resources needed so that districts failing to meet expectations will have an opportunity to meet these State standards. In conclusion, in the results of this research we hope to understand what we could cite as criteria and implement policies to decrease or avoid State takeovers overall.

SALVAGED WOOD MARKET INQUIRY: STEPS FOR UNDERSTANDING THE PROCESS OF SALVAGED WOOD
Evan Morton
Category & Time: Social Sciences, Section 1, 2:30 - 3:45 PM
Poster: 348
Mentor(s): George Berghorn

In Domicology, it is understood that wood can be salvaged from an abandoned structure. There is limited information to understand the processing of salvaged wood and making it available to the consumer. Understanding the process of wood re-use is a key for a business to enter the salvage wood products industry, with a confidence that their product is marketable. The literature review shows that there is limited research regarding the salvaged wood industry. In this exploratory study, the salvaged wood industry will be examined by conducting quantitative analyses, surveying companies, and conducting phone interviews. The objectives of this research are understanding the life cycle analysis (LCA) of salvaged wood, studying the key market factors which influence the demand for salvaged wood, and understanding the business practices followed by salvaged wood companies. The results of this research will provide a framework of steps recommended to be followed for venturing into the salvaged wood industry and help businesses foresee the outcome of performing life cycle analysis on salvaged wood.

UNDERSTANDING HOW A LIMITED ACCESS TO RESOURCES HAS LED TO THE UNDERREPRESENTATION IN THE MEDICAL AND BIOMEDICAL RESEARCH FIELD THAT WE SEE TODAY
Jemison Yewah
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 349

According to the 2017 US Census, black men and women make up 13.4% of the total population in the United States, yet when we look at their representation in the medical and biomedical research field, they only make up 4%. This research examines the experiences of black men and women who are interested in these fields and who are currently practicing to show a systemic and historical viewpoint on how a limited access of resources amongst the different racial demographics has led to the underrepresentation we see in these fields today by black men and women. Resource gaps play a negative role in placing these black men and women at a disadvantage. We define resources as (but not limited to) socioecomonic status, mentorship, role models, educational upbringing, exposure, and peer/general support. This study was tackled from 3 different levels: undergraduates interested in these fields, graduate/medical students, and current adults practicing in these fields. The study used an interviewing method intended to showcase the experiences of these black men and women and to show how much of a significance access to resources is in their journey. The participants answered several questions and then the data was analyzed. We expected that with such a long and tedious

journey with pursuing these fields, the effects of resources would be significant. Understanding this intersection of race and representation and its roots in these fields can help researchers tackle issues of health disparities in the future.

GENTRIFICATION AND HEALTHY FOOD ACCESS IN DETROIT
Ashton Jordan
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 350
Mentor(s): Steven Thomas

In the United States the lack of commercial establishments selling fresh fruits and vegetables in certain neighborhoods called "food deserts" are a problem that affects 23.5 million people. Research has shown that of those 23.5 million people living in food deserts, 50% of them are considered low income. Since such neighborhoods called "food deserts" are related to the poverty of the residents in such neighborhoods, the question for investigation is whether the process of gentrification changes such neighborhoods which leads to a reduction of food deserts.Gentrification is a process by which the neighborhood is economically upgraded by developers via the rehabilitation of housing resulting in increased in-movement of middle income residents. The objectives of this paper are to determine whether neighborhoods that are gentrified are different than neighborhoods that are not gentrified in the provision of fresh fruits and vegetables to residents. It is hypothesized that gentrified neighborhoods will have fewer food deserts and thereby provide more establishments selling fresh fruits and vegetables. Detroit is used as a case study. Data will be obtained from the U.S. Bureau of the Census American Community Survey Five Year Estimate 2011-2015 and directories of food establishments. The data will be analyzed using the Darden-Kamel Composite Socioeconomic Index. The index will enable gentrified neighborhoods to be clearly distinguished from non-gentrified ones by census tracts. The addresses of food establishments will be located by census tracts using the U.S. Bureau of the Census Geocoder This is the first study to examine the influence of gentrification on food deserts using such methods. The results will have policy implications for city officials and residents residing in food deserts. The expected results are that: (1) there will be a higher prevalence of health food options in gentrified neighborhoods than non gentrified neighborhoods; and (2) there will be a higher prevalence of fast food options in non gentrified neighborhoods than gentrified neighborhoods.The findings are generalizable to other cities where food deserts exist and the process of gentrification is occurring.

THE IMPACT OF PUBLIC PERCEPTIONS OF POLICE ON CRIME POST-FERGUSON
Pero Dagbovie
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 351
Mentor(s): Joseph Cesario

Following the killing of Michael Brown in Ferguson, Missouri and the ensuing riots and chaos, there emerged something known as the "Ferguson Effect," the dominant notion says that following Brown's murder there was a focus on police officers' dealings with minority communities. According to this effect, it is believed officers have disengaged from various policing methods. This research project tests for evidence of the Ferguson Effect on policing and crime. Most literature on the Ferguson Effect, such as Dr. Rosenfeld's 2016 paper "*Documenting and Explaining the 2015 Homicide Rise: Research Directions*", defines it through this narrow view. However, there may be a broader 'Ferguson Effect' happening on the psychology of the citizens, as changes in trust in policing impact crime rates more broadly. This will be tested by examining whether changes in citizens' confidence in police corresponds to changes in crime rates over time. Data on confidence in the police will be taken from Gallup Analytics, assessed through telephone interviews with over 4,000 individuals from all 50 states. Data on changes in crime rates will be taken from several different crime databases, including from the Federal Bureau of Investigation, the Bureau of Justice Statistics, and the Center for Disease Control. Other possible models of the "Ferguson Effect" will also be tested, such as a model that considers whether changes in discretionary policing have impacted crime rates.

UN'S INFLUENCE ON SIERRA LEONE AND SUDAN'S POST-CIVIL WAR PROVISIONS FOR FEMALE COMBATANTS
Niyat Ogbazghi
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 352
Mentor(s): Jakana Thomas

Despite both having a large number of female combatants in the Sierra Leone civil war and the second Sudanese civil war, Sierra Leone only included one provision for women in its peace agreement while Sudan had seven. Although both countries' peace agreements included provisions for women and had a large number of active female combatants who performed combat as well as "wife" duties in the war, experienced high rates of sexual abuse, and many other commonalities, there were major differences in the countries' provisions. On October 31, 2000, the United Nations Security Council passed a resolution that promoted the involvement of women in the peace-making process around the world. The Sierra Leone peace agreement was created in 1999 before the resolution while the Sudanese peace agreement was created in 2005 after the resolution. Therefore, in a most-similar case research design between both countries, we will be demonstrating how the UN's resolution was the only factor that contributed to the countries' differences in provisions for women. We will be answering the general question: how has the UN's 1325 resolution influenced the presence of equality provisions in peace agreements? Through answering this question, our goal is to demonstrate that the resolution was significant creating profound changes in the representation of provisions for women in the peace making process. We will be constructing our own codebook of provisions for women from the Sierra Leonean and Sudanese peace agreements and comparing them with the University of Edinburgh's codebook. Furthermore, we will be analyzing reports from the UN to provide context to the differences between the countries' provisions for women as well and peer reviewed articles to support those differences. We hypothesized that if a country's peace agreement was created after the 1325 resolution was passed, then the peace agreement would provide multiple provisions for women and provide greater protection for women than the peace agreement constructed prior to the resolution.

INDIVIDUAL DIFFERENCES IN PREFERRED TEMPO
Jacob Zerka
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 353
Mentor(s): J McAuley

Previous research has identified the concept of individual "preferred tempo", which is the spontaneous tapping rate of an individual. To explore this concept, we developed an online website called "Adagia" to investigate which factors may influence one's preferred tempo. Previous work has demonstrated that adult preferred tempo is around 120 beats per minute, and this varies throughout the lifetime with young children generally have a faster tempo and older adults having a slower tempo. Adagia collects spontaneous tapping data from each participant along with other information, including age, gender, musical experience, surrounding environment, and geographical location. The website was shared through various outlets such as social media and public posters, where it was labeled as a "Citizen Science Project" in order to gain a wide range of data entries across a variety of demographic factors. On-going data analysis of 809 participants shows that a slower preferred tempo is significantly correlated with low levels of environmental noise and greater age. In addition, females and non-musicians tended to have higher preferred tempos, although these results were not significant. On-going analysis will also be completed to further explore regional differences in urban and rural cities where data is concentrated along with continued investigation of demographic factors which influence preferred tempo.

ALONE TOGETHER: OBSERVATIONS OF FAMILY DEPENDENCY TREATMENT COURT PARTICIPATION
Sadie Shattuck, Erik Wittrup, Lindsay Huey
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 354
Mentor(s): Anna Santiago

To address the familial needs of child welfare cases involving child maltreatment and parental substance abuse, the Family Dependency Treatment Court (FDTC) uses frequent drug testing and hearings, swift service interventions, and an interdisciplinary team approach. Previous evaluations of FDTC programs suggest that participation yields an increased likelihood of parental reunification with their children, successful completion of the court's requirements, and sustained sobriety following program completion. While multiple studies support the utility of FDTC, few studies observe participant progression through the multiphase FDTC program or examine participant responses to the outcomes

experienced by other participants. In this qualitative study, we utilize five months of observations of FDTC hearings, a systematic review of public record court files, and in-depth semi-structured interviews to follow the progress of 19 FDTC program participants. Three questions guide our research: (1) How do participant relationships with FDTC program staff and other participants influence their sobriety?; (2) How does observing the progress or struggles with meeting program requirements of other FDTC participants influence resilience and program completion?; and (3) How do these vary by phase? Thematic analysis reveals multiple themes related to the influence of participant relationships with FDTC program staff and peers underscoring the importance of their support in meeting the FDTC's rigorous program requirements. Participants who maintained their sobriety frequently focused on the end goal of reunification with their children but struggled when other peers advance through program phases when they failed to do so.

DEMOCRATIC REVOLUTION SWEEPS TUNSIA AND FAILS EGYPT
Umar Hussan
Category & Time: Social Sciences, Section 2, 2:30 - 3:45 PM
Poster: 355
Mentor(s): Benjamin Appel

In early 2011 the Arab World was in the midst of massive political upheaval as protesters across the vast majority of the region took the streets demanding political reform. Western analysts quickly dubbed these protests as the "Arab Spring" for its wide reach across the region. Therefore, in this study, we will be examining a comparative analysis of two nations that exhibit various social and political similarities. Nearly eight years after the removal of Zine Al Abidine Ben Ali and Hosni Mubarak, Tunisia has transitioned to a semi-democratic country while Egypt's case remains to be seen. This project will identify two variables that have contributed to the varying outcomes in these two cases. In Tunisia democratic consolidation has been swift while matters in Egypt have in some ways worsened. Specific variables that we seek to explain democratic development are cooperation amongst oppositional forces as well as foreign aid. We will be conducting a qualitative content analysis using article reports, voting records and journals to evaluate the validity of these variables, with the hope of finding that cooperation amongst oppositional forces enhances a nation's capability to successfully transition to democracy while foreign aid hinders democratic development.

THE EFFECTS OF ETHNIC PARTITIONING ON IDENTIFICATION PREFERENCES IN SUB-SAHARAN AFRICA
Gregory Amusu
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 357
Mentor(s): Christian Houle

Conventional wisdom in African politics has held that the partitioning of various ethnic groups as a result of the imposition of artificial international borders by European colonial powers during the "Scramble for Africa" has had a negative effect on the national sentiment held by members of partitioned ethnic groups. However, analysis of recently obtained individual-level data from Afrobarometer in conjunction with data on ethnic group characteristics and partitioning from the Ethnic Power Relations Dataset indicates that the converse is true. There are three potential explanations to this counterintuitive finding: that ethnically partitioned groups were different from the beginning, stipulating that borders were not drawn arbitrarily, and those that were split had lower within-group loyalty; the creation of borders in itself reduced within-group loyalty among partitioned groups; and finally, that colonial and pre-colonial authorities employed strategies to reduce threats from partitioned groups. At its core, this paper has two aims. First, to demonstrate empirically that ethnically partitioned groups are, on average, more likely than non-partitioned groups to indicate the primacy of their national identification over their ethnic identification. The second aim is to clearly define a causal mechanism that explains the empirical findings. Previous studies have cast doubt on the partitioned group threat minimization and the non-arbitrary border design hypotheses. As such, we argue that it was the act of imposing partitional state borders that reduced ingroup loyalty among divided ethnicities

DIFFERENCES IN ADHERENCE OF COMMUNITY SCHOOL STANDARDS ACROSS SCHOOL SITES
Karina Mojica
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 358
Mentor(s): Ignacio Acevedo

Community schools were created as an approach to provide resources and services to underserved communities. According to the Institution for Educational Leadership, community schools consist of community partnerships and schools that collaborate to provide enrichment, health, and social services to students, families, and other community members. The end goal of community schools is to ensure the success of its students in school and life by providing these resources. While community schools have shown to be effective in improving communities, there is little research that discusses the evaluation of their school standards. Through the Community Education Initiative, we look at how the development of community schools in a legacy city of Michigan have adhered to the national community standards. Adherence is important to not only the schools we are evaluating, but as a contribution to the literature, because it will let community school educators, other professionals in this area, and community members know about the standards and how well they are being considered when developing each community school. This will be achieved by taking the scores that each school receives and looking at how well they performed in comparison to the other schools in their district. These scores will consist of compiling the average rating each participant has given in the assessments. When we look at which school sites are doing the best, then we can further research by looking at what specific schools are doing in comparison to the other schools to demonstrate better adherence.

COLLEGE SUPPORT SERVICES FOR STUDENTS WITH AUTISM
Katlyn Sweeney
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 359
Mentor(s): Brooke Ingersoll

The transition to college involves increased independence and a more complex academic and social environment. These demands can be particularly challenging for students with autism (ASD), who exhibit unique difficulties with social communication and restricted and repetitive interests and academics. As more individuals with ASD attend college, there has been a growing focus on supports for students ASD, both in the research literature as well as in University Disability Offices. This mixed-method research project will examine ASD support services from multiple perspectives, with the aim of understanding the degree to which current four-year colleges and universities provide the supports for college students with ASD to be successful. This project will conduct a systematic review of the literature to determine the recommended best practices in college supports for students with ASD. This framework will be used to analyze services offered to students with ASD at four-year colleges and universities in the Midwest (Michigan, Ohio, and Illinois). Services offered will be examined using content analysis of disability services websites for each college/university. This information will be compared with data from a survey of college students with ASD in the Midwest examining service use and satisfaction. This information will be integrated to determine the degree to which colleges provide best practices in ASD support services, as well as the degree to which students access these services and perceive them to be helpful. We expect that colleges/universities will offer academic modifications consistent with best practices, but will be much less likely to offer transition, social, and independence supports. Determining what supports and services are perceived as being most helpful will eventually allow academic institutions to more effectively serve students with ASD.

WOMEN'S EXPERIENCES IN PRISON PROGRAMS
Debbie McGee
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 360
Mentor(s): Jennifer Cobbina

Approximately 111,000 women are incarcerated in the United States making up 6.9 percent of the total prison population. Prison programs and facilities were not always invested in, from the 1970's to 1980's. By 1990 there were improvements in the programs provided. Rehabilitation for many facilities provided pre- release programs. The types of rehabilitative services include work, programs, educational, spiritual, and transitional. The most common programs are education and work programs. Education were found to be an effective in reducing the rates of recidivism. This study will examine the gap between women's experiences in prison programs. Utilizing in depth interviews with 26 incarcerated women in Missouri, this study will examine women's experiences with prison programs. Particularly, this study will examine what aspects of the programs were helpful or unhelpful and identify potential areas for improvement. Implications for policy and future research will be discussed.

THE ASSOCIATION OF CROSS-RACE FRIENDSHIP TO QUALITY AND LENGTH OF FRIENDSHIP
Rachel Johnson
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 361
Mentor(s): Yijie Wang

Friendships are important because they promote self-validation and loyalty. Specifically, cross-racial friendships (CRF) have been shown to help foster positive racial attitudes and lead to the integration of people, reducing prejudice and segregation. To determine what helps create a lasting cross-racial friendship the quality of this friendship must be assessed. It is unknown in African American children who are less likely to have friendship reciprocated in general, what qualities in their friendships relate to the length of their friendships with reciprocated friends in general. The length of CRF have been shown to decrease when children grow up, with an increase in criteria for friendships as a possible cause. While some see CRF as the same as same-race friendships (SRF) in the way of the emotional, social and instrumental support expected to be received. While Researchers have found that CRF can be a valuable friendship to increase social capital and the reciprocation of friendship can lead to social competency. Therefore, using data from the National Longitudinal Study of Adolescent Health (Add Health), we investigate the relationship between length and quality of CRF's for African American children. We expect that for African American children who have an increase in quality CRF compared to SRF the length of the friendship will be increased as well.

TO REVEAL OR NOT REVEAL: DIFFICULTIES WITH REQUESTS FOR ACCOMMODATIONS FOR EMPLOYEES WITH PSYCHIATRIC DISABILITIES
Keenan Case
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 362

A law and literature review asessing some of the shortcoming in the Americans with Disabilities Act in regards to employees with hidden disabilites finding accomodations at work.

THEMATIC CODING OF INTERVIEWS ABOUT GLOBAL HEALTH
Donald Shell
Category & Time: Social Sciences, Section 3, 2:30 - 3:45 PM
Poster: 363
Mentor(s): James Dearing

Through careful analysis of different innovations, my research team developed a conceptual framework model for the Robert Wood Johnson Foundation Global Health team. The goal of our model was to find out how one would diffuse international innovations to the U.S. in a way where they would spread to different communities and become successful. Through months of research, some of the facts we've found were that the innovations had to be well received and show evidence of growth in the U.S. We have been working on interview questions for these different health sites to figure their scale up processes, things that are included such as whether the innovation is accessible for everyone and who their linking agents may be as they can hold strong factors into whether or not people try the ideas. We filtered the best innovations by coming up with 4 selection criteria. We officially started our project last December and now we're ready to visit these different sites to collect data.

DO CITY-LEVEL GROWN FOOD LABELS INCREASE CONSUMER DEMAND FOR LOCAL PRODUCE?
Michael Puttarat
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 365
Mentor(s): Trey Malone

Urban farming is the practice of growing or producing food within a heavily populated town or city. Organizations have implemented locally grown labels on their commodities in order to help consumers identify locally grown food. The primary objective of this study was to specifically determine how city-level locally grown labels affect consumer demand for urban produce. In order to do so, we created a choice experiment where participants will choose between three choices of Pink Lady apples. The three apples are categorized by being grown from a farmer that the participant knows, and whether the apple is grown local or non-local. The choice experiment consists of eight questions where the apples within the three categories vary by having a food locality label or not, and price. To specifically scrutinize the effect of food labels on consumer preferences in the choice experiment, we used an orthogonal fractional factorial design. Fifty users on Amazon Mechanical Turk will participant in the Pink Lady Apple choice experiment followed by a survey on the

participant's demographics and social motives when choosing to consume local produce. A t-test will be used to see if a significant relationship exists between different social motives and apple choices. Choice experiment data will be analyzed using a multinomial logit model. We expect that participants will show a preference for Pink Lady apples grown by a local farmer they know, and apples that have locally grown label attached.

INCREASING THE UNITED NATIONS SECURITY COUNCILS' EFFICACY IN REDUCING AND DETERRING TERRORIST BEHAVIOR

Lance Lindsay
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 366
Mentor(s): Benjamin Appel

The UNSC and their resolutions have assisted in ending many conflicts worldwide between states. Other scholars have discussed the symbolic and historic meaning of UNSC involvement in world affairs. It seems pertinent that the UNSC should have the proper tools to address all international conflicts for the sake of international peace and security as directed by its founding mandate. Our question: Can the United Nations Security Council deter terrorism more effectively with an independent military force, based on the use of sanctions and use of force? We hypothesize that the use of UNSC force will more likely lead to less of a duration in terrorist activity from the start to end of events/conflicts. We will analyze terrorist activity (1970-2014) by utilizing the Global Terrorism Dataset hosted by the University of Maryland. Targeting the country, conflict(s) year, which country got involved and if there was also UN involvement in a related conflict. While looking at the attacks, we intend to look at variables such as actors involved, attack type, response type, duration to termination, weapons used, target/victim information, casualty count, and frequency. We expect to see Economic Sanctions and discriminate Use of Force as methods that tend to work best in resolving conflict and if so they should be used more often.

BIOLOGICAL AND ENVIRONMENTAL REDUCTIONS IN PERCEIVED AGENCY ON EVALUATIONS OF DESERVED BLAME AND PRAISE

Joshua Confer
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 367
Mentor(s): William Chopik

Conceptions of moral responsibility are associated with the degree to which people ascribe agency to the behavior of others. Although reduced free-will beliefs are associated with diminished support for deserved punishment, it remains unclear to what extent a reduced sense of agency affects support for deserved reward. Additionally, it is not known how biological and environmental circumstances of moral actors impact judgments of agency, punishment, and reward. Two studies investigated this by using vignettes that described either a crime or a good deed, and manipulated the actor's biological makeup or environmental history. Study 1 investigated the impact of extenuating circumstances on judgments of agency and punishment. Biological and environmental circumstances both reduced evaluations of agency and punishment. Biological circumstances demonstrated larger effects than environmental circumstances. Mediation analyses confirmed that biological considerations reduced agency, which in turn reduced punishment. Following this, Study 2 measured the impact of extenuating circumstances on judgements of agency and reward. The results indicated how reductions in perceptions of agency alter how we morally evaluate the behavior of others. The findings are discussed in the context of a broader model of judgement, agency, and punishment/reward and the processes that give rise to each.

THE RELATIONSHIP BETWEEN PARK USAGE, MAINTENANCE, AND NEIGHBORHOOD DEMOGRAPHICS

Mariah Thompson
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 368
Mentor(s): Amber Pearson, Ashton Shortridge, Ben Dougherty

Accessibility to quality green spaces (e.g., parks) has been associated with health benefits. However, not all parks are inviting or used due to maintenance issues, crime, and overgrowth of vegetation. There may be a relationship between park maintenance, actual usage, and the socioeconomic status of the neighborhoods that surround parks.This study investigates how the condition of parks in Detroit and Lansing may relate to actual usage, and how well actual usage reflects the demographic characteristics of the neighborhood. In order to assess these relationships census data for population demographics at the census tract level will be compiled. Additionally, observational data will be collected at

each park using the Systematic Observation of Play and Recreation in Communities (SOPARC) tool, to capture characteristics of those using the park, including physical activity level, gender, age, and ethnicity. Conditions of the park will also be observed using Adopt-a-park guidelines and indications of care from the literature. The findings will have important implications for health geography because it investigates potential inequality within parks which can have an impact on the health of those around it.

ONE STEP AT A TIME: MOVING TOWARD ACCESSIBLE PUBLIC TRANSPORTATION IN DETROIT
Joseph Ingall, Michael Zandstra
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 369
Mentor(s): Marya Sosulski

For major cities, recognition as world class is a common goal. In order to achieve and maintain such a status, many aspects of a city must be of the highest quality. This study highlights Detroit, Michigan, with public transportation (regarding ease of use, access, and mobility) being the main aspect considered. When considering the movement of people throughout a city, whether individually or in groups, it is critical to recognize and provide for the needs of all who utilize public transportation. Populations that experience limits to mobility, such as older adults and people with disabilities, are frequently overlooked, especially in the field of public transportation systems. This study concentrates on the voices and opinions of community members in the the 13 neighborhoods surrounding the historic State Fairgrounds site. Data has been collected and analyzed through outreach with these community members in the form of a survey, community maps, focus groups, and interviews. With community mapping tools, precise geographic data can be used to further support Asset-Based Community Development (ABCD) in Detroit. In using all forms of analyzed data, Detroit's public transportation system will have a stronger chance of paving the path toward world class recognition, as well as thoroughly supporting all community members and visitors alike.

SECOND TIME IS THE CHARM: DIFFERENCES AND SIMILARITIES BETWEEN PAST AND CURRENT PARTNERS
Devon Mccoy
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 370
Mentor(s): William Chopik

Research on partner selection has often focused on the similarity in characteristics between partners. However, not all relationships last forever. It is unclear whether our preferences change from one partner to the next. Do we tend to date people who are similar to our past partners? Are our new partners more similar to us than our previous ones? In the current study, we examined similarities and differences between current and ex-partners on a range of characteristics (e.g., age, BMI, depression, activities of daily living, physical activity, and health). Using data from the Health and Retirement Study (N= 971, M_{age}= 61.59, SD= 10.92, 44% female, 80.3% White/Caucasian). In comparing ex-partners to current partners, current partners were younger, less depressed, have less disability, and are healthier (ds range from .11 to .53). In examining similarity, participants found new partners who were more similar to them in health but less similar in depression. However, there was a reliable correlation between ex- and current partners in age, BMI, depression, disability, and health, suggesting that our current partners somewhat resemble our past partners. Based on the results of the current study, people tend to find new relationships with healthier and happier people, but there is always some resemblance to the people we dated in the past.

EVALUATING INNOVATEGOV
Timothy Herd
Category & Time: Social Sciences, Section 4, 2:30 - 3:45 PM
Poster: 371
Mentor(s): Joshua Sapotichne

Detroit since the 1970s has been a predominately Black city due to factors such as White flight, housing segregation, and racism led to the culmination of the race riots in the late 1960s. Although there were improvements, Detroit never fully recovered from an economic or moral standpoint. Programs such as InnovateGov offer students at Michigan State University the opportunity to help heal the wounds of this rapidly recovering city through community service and civic engagement. This research examines seven participants (students, facilitators, partners) of the InnovateGov summer program based in Detroit, and how they make meaning of service learning with others in order to advance understanding between diversity and service learning. It also measures the impact that InnovateGov has had on the city of Detroit and the impact that the program has had on the seven participants in the program. InnovateGov is a unique

program in that it embeds students into local government departments and non-profits. In fact, the civic partners of InnovateGov expand more than a dozen local government departments by 2017, three years after its inception. Through an evaluation of InnovateGov by interviews and a grounded theory qualitative analysis, we are able to gather personal accounts on how those seven participants engaging with the program made meaning of their impact on the city and the residents of Detroit.

EXAMINING THE STUDENTS: ATTRIBUTIONS OF PROGRAMS TO SENSE OF BELONGING IN MSU'S COLLEGE OF ENGINEERING

Harmony Murray, Aubrey Sneed
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 374
Mentor(s): Cary Roseth, Daina Briedis, Elizabeth Garcia, Jennifer Schmidt, Stephen Walton, You-Kyung Lee

In Science, Technology, Engineering, and Mathematics (STEM) disciplines, underrepresented racial minorities (URM) are less likely to complete degrees in STEM than their non-URM counterparts. Past research suggests involvement in university programs leads to an increase in students' sense of belonging over time, whereas less involvement leads to a decrease in belonging. Given the importance of belonging to students' academic success, this study will focus on engineering undergraduate students (N = 1,305) at a large, Midwestern University. The first research question examines whether there is a mean difference in sense of belonging in the college of engineering between URM and non-URM students using a t-test. For the second research question, this study examines whether there are differences in attributions (e.g., academic support, social activities) of students' sense of belonging to the college of engineering between URM and non-URM students. To analyze the data, we created separate groups to accurately determine the relationship between attributions and sense of belonging: (1) high belonging URM; (2) low belonging URM; (3) high belonging non-URM; and (4) low belonging non-URM groups. A MANOVA will be used to examine the mean differences attributions and sense of belonging among these four groups. We expect URM students will attribute academic support (e.g., advising) to a higher sense of belonging, and social activities (e.g., base groups) will attribute to a lower sense of belonging. It is important to investigate what programs may highly benefit URM students because of their systematic disadvantage in the U.S. education system.

ARE THERE SEX DIFFERENCES IN THE RELATIONSHIP BETWEEN PARENT-CHILD CONFLICT AND HOSTILE ATTRIBUTION BIAS IN CHILDREN?

Ian Sorensen, Giovanna Cusumano, Zehra Jaffar
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 375
Mentor(s): Sybil Burt

Hostile attribution bias (HAB) is the tendency for individuals to interpret ambiguous behaviors of others as aggressive. HAB is theorized to result from inaccurate social information processing, resulting in increased aggression, mortality, and domestic conflict in children and adults. Specifically, individuals with HAB have aggressive schemas, which may normalize aggressive behavior and lead them to misinterpret ambiguous situations as hostile. These schemas are thought to be formed by consistent exposure to aggressive behaviors during development. While a substantial amount of research has examined the effect of exposure to aggressive entertainment and social media, less is known about the effect of exposure to hostile family experiences. Additionally, sex differences in social information processing in childhood are rarely studied. Therefore, the current study assessed whether child sex moderates the relationship between parent-child conflict and HAB in children (N=2,060). Participants self-reported on parent-child conflict separately for each parent. HAB was assessed using a social information processing task in which participants responded to questions regarding hypothetical aggressive situations. Moderated regression analyses, conducted via multi-level modeling, revealed that mother-child conflict significantly predicted HAB, but father-child conflict, sex, and the interactions between parent-child conflict and sex did not. This suggests that familial risk factors like mother-child conflict may play a key role in the development of HAB. Therefore, expanding treatments for HAB to include parentchild intervention may improve outcomes via not only cognitive restructuring to create more positive schemas, but also reducing parent-child conflict to reduce exposure to aggressive responses.

INSUFFICIENT EFFORT SURVEY RESPONDING: EXAMINING DETERRENCE THROUGH A BENIGN-WARNING
Uriel Saldivar
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 376
Mentor(s): Jason Huang

Survey data in psychological and organizational research is vulnerable to Insufficient Effort Responding (IER), responses from participants that are careless or random. The current study mirrors Huang and colleagues' (2012) study on IER deterrence, which found warnings to be effective in deterring effortless survey responding in participants. Little research has focused on the deterrence of effortless survey responding despite its potential to inflate observations, threatening the quality of data collected in organizational and psychological research. The purpose of this study is to examine the use of a benign-warning as a potential IER deterrent, which may be practical in low-stakes survey settings where no incentive or reward are offered. In an experiment, 400 participants recruited via Amazon MTurk were randomly assigned to the warning instruction condition and a normal instruction condition. Participants will then respond to a personality survey online. The study will examine the presentation of a benign-warning to participants as a means of deterrence using four indices for detecting IER: individual reliability coefficients, psychometric antonyms, response time, and long string. IER scores between participants who receive a warning and those in the normal condition will then be analyzed to examine the effectiveness of the benign-warning. It is anticipated that participants in the benign warning condition will have significantly lower IER prevalence than those in the normal condition.

THE INTERSECTION OF RACE AND ATTRACTIVENESS IN IMPLICIT BIAS
Valerie Kemp
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 377
Mentor(s): Joseph Cesario

It is common knowledge that race bias exists, and it has been proven that attractive people tend to experience better treatment than the unattractive, but what happens when those two intersect? Does an attractive person from a perceived racial group that generally experiences racism get the same positive treatment as an attractive white person? Do unattractive white people experience less negative treatment than other racial minorities? This study aimed to find out. Using the affect misattribution procedure (AMP), participants were shown a series of Black, White, and Asian, faces independently rated as being high or low in attractiveness from the Chicago Face Database followed by a Chinese character and were then asked to rate the Chinese character as either pleasant or unpleasant. The AMP has been proven to show that when rating the Chinese character, participants are in fact showing their implicit attitudes toward the preceding faces. The hypothesis was that faces rated high in attractiveness, regardless of race, would score higher in pleasantness than faces rated low in attractiveness. Results supported this hypothesis, showing no main effect of race and a main effect of attractiveness, meaning that participants rated faces of any race that were high in attractiveness as pleasant significantly more than faces rated low in attractiveness.

REGULATING DISTRESSED HOUSING MARKETS THROUGH THE USE OF PRE-SALE ORDINANCES
Najma Muhammad
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 379
Mentor(s): Noah Durst

Pre-sale inspection ordinances are rules enforced by cities and counties that require homeowners to bring their homes into compliance with housing and building codes before they are allowed to sell them. These ordinances aim to address issues of blight and code-non-compliant housing in distressed housing market. There is limited academic research examining the efficacy of pre-sale ordinances, although preliminary evidence suggests that they may actually have the unintended consequence of exacerbating disinvestment in the home and preventing owners from selling their property. This research project, supervised by Dr. Noah J. Durst, Assistant Professor of Urban and Regional Planning, aims to understand where and why these ordinances have been adopted and whether they have achieved their intended purpose.

QUALITY OF LIFE: THE EFFECT OF COPING STYLES ON AUTISM SPECTRUM DISORDERS
Kimberrly Colon
Category & Time: Social Sciences, Section 5, 2:30 - 3:45 PM
Poster: 380
Mentor(s): Gloria Lee

Effective coping is a fundamental skill necessary to manage stressful situations. Neurodevelopmental disorders have been shown to impede effective coping skills in populations, with the increase in prevalence of these disorders research must also increase to meet the demand of the population. A large number of individuals who have Neurodevelopmental disorders have issues with depression, anxiety and suicidality in their lifetime; showing further need for treatment. Limited research has been focused on the coping styles most often used in this population of individuals. Using data conducted by Lee (2012), we will study the coping styles of 22 (ages 7-17) children who have been clinically diagnosed to have High Functioning Autism Spectrum Disorders and observe the self-reported quality of life of these children. Using both the KidCope and PedsQL we will run a statistical analysis on the coping mechanism (Positive/Negative) most commonly used in this population, the effectiveness these coping skills had in a self- reported stressful situation, and the quality of life in this population. We predict that positive effective coping styles will show the greatest quality of life scores, and negative coping skills having lower quality of life scores due to the strain negative coping has on interpersonal relationships.

BEHAVIOR TECHNICIAN EXPERIENCE AND THE VARIABILITY IN THE LANGUAGE OF KIDS WITH AUTISM SPECTRUM DISORDER
Katie Alvarez
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 384
Mentor(s): Joshua Plavnick

RATIONALE: This study investigates the relationship between behavior technician experience and language progression in children with autism spectrum disorder (ASD). ASD is a disorder that affects one's development of social skills, language skills, and emotional attachment. According to a 2018 study, 1 in 59 children have been identified with ASD. In a type of therapy called early intensive behavioral intervention (EIBI), behavior technicians (BT) are instructors for children with ASD. The current researcher hypothesizes that when children with ASD are paired with more experienced BTs, their language will develop more than when they are with less experienced BTs. METHODS: Language data was collected using the *Language Environment Analysis* (LENA) system. The rates per minute (RPM) of adult word count (AWC), child vocalizations (VOC), and conversation turn count (CTC) were recorded per monthly assessment. The RPM for each variable (i.e., AWC, VOC, CTC) at each assessment was compared with behavior technician experience at the time of assessment. Behavior technician experience (BTE) was measured by identifying how long each BT had been working for an EIBI learning institute at the time of each assessment and ranked on a scale of 0-5. RESULTS: We predict that RPM of AWC, VOC, and CTC will rise as BTE rises. We predict that the dependent variables have a statistically significant positive correlation with the independent variable. CONCLUSIONS: Behavior technician experience may have a significant impact on the language development of children with ASD.

THE LONG TERM EFFECTS OF 4-H CAPITOL EXPERIENCE ON YOUNG ADULT CIVIC ENGAGEMENT
Heather Mahoney
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 385
Mentor(s): Chelsea Hetherington

4-H Capitol Experience is a unique four day MSU Extension program for high-school-aged youth in Michigan. This program teaches youth about the policy process at the state level, allows them to explore how a policy affects different people and communities, and helps them discover how to be actively involved in the policy-making process, even before they are eligible to vote. This is done through a simulation experience where students are divided into committees, write bills, and hold elections. Post-event evaluations show that participants gain skills and knowledge that will support future civic engagement. The present study is a follow-up with past participants, currently ages 20 to 25, to examine any lasting effects on civic engagement and policy interest from 4-H Capitol Experience. We will administer surveys to past 4-H Capitol Experience participants, collecting data on their current civic engagement attitudes and behaviors. We will also ask other 4-H pre-college program alumni to complete the same survey as a control. This presentation will compare the civic engagement of those who did attend 4-H Capitol Experience with other 4-H pre-college program alumni who did not attend this specific program. Our hypothesis is that the youth who attended 4-H Capitol Experience will be more civically engaged as adults compared to other 4-H pre-college program alumni. While young adults are often criticized

for their lack of civic engagement, our study hopes to show that there are young adults who care about and participate in government, and that this program helped to foster the skills and knowledge needed to participate effectively.

YOUNG CHILDREN'S EARLY WRITING DEVELOPMENT: ASSESSING COMPOSITION
Sarah Jenuwine, Laurin Schultz, Makenzie Callahan
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 386
Mentor(s): Hope Gerde, Ryan Ringle

Young children begin to develop writing, an essential literacy skill, prior to kindergarten entry, and these skills predict later reading success. Writing is comprised of three components: handwriting, spelling, and composing. Currently, what is known about early writing focuses on young children's transcription skills including the letter forms they write (i.e., handwriting) and their ability to create words using letters and letter-sounds (i.e., spelling). What remains unknown is how children compose, or generate ideas for writing, which is the valuable, meaning-making part of this skill. The current study utilizes an innovative measure of early writing to capture children's composing in order to 1) describe children's composing attempts and 2) examine how composing develops across preschool. Children (*N*=364) ages 3-5 years participated. Each child completed a writing assessment to compose a story. Each child was given a picture and asked, "What is mama penguin saying to little penguin?". This verbal response was recorded, and the child was asked to, "Write that here". Afterward the child is asked what they wrote, and this response is recorded as well. Composing was scored for number of ideas, parts of speech (i.e., nouns, verbs, adverbs/adjectives), writing relevance, and association between pre/post verbal responses and writing. Child writing was coded for transcription skills: letter formation and spelling. Results include descriptive analyses depicting children's composing in the fall and spring of preschool and an examination of differences across the school year. The discussion will identify the implications of this work for child development and assessment.

TEACHER STRATEGIES THAT PROMOTE SOUND TRANSITIONS IN PRESCHOOL CLASSROOMS
Juwon Park, Kyla Mcroy, Darienne Moore, Theo Vanegeren
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 387
Mentor(s): Haruka Konishi, Lori Skibbe

Transitions are defined as the duration of time it takes to change activities or settings. Research has shown that young children spend roughly 20% to 35% of their time in school in transitioning from one activity to another. Children commonly struggle with transitions, particularly if they are long in duration, and those who struggle with transitions may exhibit challenging behaviors that may interfere with their learning process. Despite the importance of transitions, little empirical work has focused on a variety of the teaching strategies used to help children successfully transition between classroom activities. The present study describes the types and duration of teaching strategies used during transitions in three different classrooms in a nationally accredited preschool. Observations lasted 3 hours in the fall of the school year. Results will show the frequency of each type of strategy observed for each teacher.

IMMIGRANTS IN RURAL AMERICA
Min Hee Cho
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 388
Mentor(s): Mark Skidmore

Immigration trends in the United States are beginning to shift, with more immigrants moving to rural areas, as opposed to urban areas, for work. The foreign-born population is growing at a faster rate than the white population in rural places, causing notable demographic changes of these rural places. The lack of information on rural immigrants poses a problem because these population shifts are predicted to persist as rural areas expand work opportunities with meatpacking plants, manufacturing companies, and tourist-based economies. To address this gap, this research project investigates how immigrants in rural counties have caused demographic changes and how they have impacted local governments and institutions. Although influxes of immigrants in rural areas are marked by census data, case studies in rural America, especially the rural Midwest, reveal that immigrants struggle to access basic healthcare, language services, and other resources around them. The goal of this project is to see how and if the rise of immigrants in rural America is impacting their communities in notable ways. This project will use a fixed effects model and accounting for the countries of origin, native-born population, geographic region, and proximity to urban or metro areas that are reported by the U.S. Census Bureau. It will analyze impacts by looking at government expenditures and taxes. Rural counties are labeled as nonmetro counties with a population of less than 50,000 people. A Rural-Urban Continuum

(RUC) code will be used to classify counties based on population density and metro influence in order to account for the mix of rural and urban towns within a single county. I hypothesize that as the number of foreign-born people in a rural county increases, changes in government expenditure will not grow with the population increase, to indicate poor community resources for immigrants. The project will also include policy suggestions that aim to advise rural counties so that immigrants are able to thrive in their homes and become vital members of their communities.

STATUS OF FEMALE PALEONTOLOGISTS AT BIG 10 UNIVERSITIES
Lynnea Jackson
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 389
Mentor(s): Danita Brandt

There are fewer women in STEM positions than men as is seen in many fields. In paleontology (including the subdisciplines of micropaleontology, paleobotany, palynology, vertebrate paleontology, invertebrate paleontology, paleobiology, and paleoecology), the same is true. Among Big 10 universities male faculty in paleontology currently outnumber female faculty in paleontology 29:13. Michigan State University (MSU) has a total of two paleontologists; one male and one female. This one to one ratio makes MSU one of four schools with equal representation of men and women in paleontology. In 1980 there were no women in any of the Big 10 schools and in 1990 there were two. The data from 2017 show a positive trajectory for women in paleontology. The University of Michigan (UofM) has the greatest number of female paleontology faculty in the Big 10. For this reason, I interviewed Dr. Catherine Badgley (UofM) to understand her experience as a woman in this field. I also researched Dr. Jane Smith Elliott, a paleontologist at MSU (1943-1977) who was MSU's first female faculty member in paleontology.

WHY DIVERSITY PROGRAMS LIKE SROP NEED CONTINUOUS LEGISLATION BACKING AND SUPPORT TO SUCCEED
Roberto Hernandez
Category & Time: Social Sciences, Section 6, 2:30 - 3:45 PM
Poster: 390
Mentor(s): Matthew Anderson

Questions are often raised about the usefulness of diversity programs. We assess the effectiveness of summer bridge programs (e.g., Summer Research Opportunity Program (SROP); Summer Business Institute (SBI), etc.). Previous research has shown that using diversity as an input factor positively impacts the success and effectiveness of groups big and small. The use of diversity introduces different perspectives and points of view, which improves the quality of ideas and thought processes in the group environment. Diversity is not a self-evident outcome or phenomenon even after the signing of the Civil Rights Acts of 1964. We assess whether MSU's summer bridge programs leads to greater diversity in graduate programs. We compare outcomes from such bridge programs to populations of underrepresented and majority students where such programs are not offered. Diversity programs like SROP and SBI are generally supported because they are effective (e.g., see the CARE program at Florida State University). We assess the level of effectiveness of MSU summer bridge programs in this study.

DEPICTING BOARD CERTIFIED BEHAVIORAL ANALYSTS' PARENT TRAINING PRACTICES FOR CHILDREN WITH AUTISM SPECTRUM DISORDER
Nicole Rivera Caquías
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 394
Mentor(s): Brooke Ingersoll

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication and a pattern of restrictive and repetitive behaviors. Families of children with ASD report an unmet desire for their providers to use collaborative and strength-based strategies. Parent training is an evidence-based intervention in which providers collaboratively train parents of children with childhood disorders about strategies to help their child develop new skills and change their behavior. Unfortunately, it is underutilized in community settings despite the fact that it is highly desired by families; a recent study found rates of parent training provision by Board Certified Behavioral Analysts (BCBAs) and other master's-level behavioral health professionals to be very low, with only 33% of children receiving it at least once every three months. BCBAs are graduate-level clinicians with extensive training in developing and implementing interventions for individuals with ASD, yet a recent study found that BCBAs do not frequently provide this evidence-based intervention to Medicaid-enrolled children with ASD. Little is known about BCBA parent training practices across the United States. In the present study, approximately 2,830 BCBAs in the United States will complete a

survey to describe current parent training practices, barriers to providing parent training, and professional training experiences related to parent training. Descriptive statistics and multiple regression will be used to determine variables that predict the provision of parent training by BCBAs working in various settings across the United States.

YOUNG CHILDREN'S EARLY WRITING DEVELOPMENT: ASSESSING COMPOSITION
Laurin Schultz, Sarah Jenuwine
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 396
Mentor(s): Hope Gerde

Young children begin to develop writing, an essential literacy skill, prior to kindergarten entry, and these skills predict later reading success. Writing is comprised of three components: handwriting, spelling, and composing. Currently, what is known about early writing focuses on young children's transcription skills including the letter forms they write (i.e., handwriting) and their ability to create words using letters and letter-sounds (i.e., spelling). What remains unknown is how children compose, or generate ideas for writing, which is the valuable, meaning-making part of this skill. The current study utilizes an innovative measure of early writing to capture children's composing in order to 1) describe children's composing attempts and 2) examine how composing develops across preschool. Children (N=364) ages 3-5 years participated. Each child completed a writing assessment to compose a story. Each child was given a picture and asked, "What is mama penguin saying to little penguin?". This verbal response was recorded, and the child was asked to, "Write that here". Afterward the child is asked what they wrote, and this response is recorded as well. Composing was scored for number of ideas, parts of speech (i.e., nouns, verbs, adverbs/adjectives), writing relevance, and association between pre/post verbal responses and writing. Child writing was coded for transcription skills: letter formation and spelling. Results include descriptive analyses depicting children's composing in the fall and spring of preschool and an examination of differences across the school year. The discussion will identify the implications of this work for child development and assessment.

THE ROLE OF RHYTHM IN UNDERSTANDING SPEECH IN DIFFICULT LISTENING CONDITIONS
Sarah Dec
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 397
Mentor(s): J McAuley

The ability to understand speech in difficult listening conditions varies between people. Hearing acuity accounts for some of the variance of individual speech-in-noise (SIN) ability, but a large portion of variance remains unexplained. One factor that may account for some of the unexplained variance is rhythmic ability. Building on Dynamic Attending Theory (Jones & Boltz, 1989), the present study investigated the role of rhythm in speech perception in noise using the Coordinate Response Measure (CRM) paradigm. Participants listened to spoken sentences in the form "Ready [call sign] go to [color] [number] now" and reported the color and number of a target talker that says "Ready Baron-". The target talker was presented amidst either a 2- or 6-talker background (i.e., the masker). The rhythmicity of the target sentence and/or the masker sentences was varied by either 0% or 50%, resulting in four rhythmic combinations of target and maskers conditions (rhythmic target/rhythmic masker, rhythmic target/arrhythmic masker, arrhythmic target/rhythmic masker, arrhythmic target/ arrhythmic masker). Dynamic Attending Theory (DAT) predicts that rhythm entrains listeners' attention and directs attention to rhythmically expected time points. In the context of the CRM, DAT predicts that listeners' attention will be entrained by the target and/or masker rhythm. Consistent with DAT, results showed that that listeners were best at identifying the target color and number in the rhythmic target/arrhythmic masker condition, whereas they were worst at identifying the target color and number in the arrhythmic target/rhythmic masker conditions.

PERSONALITY BY PROXY: HOW PROBLEMATIC ARE PROXY REPORTS FOR PERSONALITY CHANGE
Lindsay Ackerman
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 398
Mentor(s): William Chopik

The use of proxy or observer-reports is common in the study of personality. A great deal of effort has been dedicated to the utility and correspondence of self- and observer reports. However, a number of surveys of human development use proxy reports, and it is unclear if their integration unduly influences studies of personality change. In the current study, we used data from the Health and Retirement Study (N = 21,257, Mage = 66.18, SD = 10.42, 58.4% Female; 76% Caucasian) followed over an 8-year period. Overall, self-reports were higher in extraversion, agreeableness,

conscientiousness, and openness to experience, and lower in neuroticism. Proxy and self-reports differed in their estimates of personality development over time. These results held when controlling for age, gender, health, education, marital status, depression, chronic health conditions, measures of disability, and cognitive ability. Worth noting, the large number of self-reports stabilized the overall averages of the broader sample. However, this may be a concern for studies that are comprised entirely of non-self-report measures or a large number of non-self-report measures. This study demonstrated the importance of examining how personality and personality change vary according to informant.

DEPRESSION AND HEALTH IN OLDER COUPLES IN THE UNITED STATES AND CHINA
Jhante' Rivet
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 399
Mentor(s): William Chopik

The current study explores associations between individual and spousal depressive symptomology and self-reported health in older married couples. Further, I examined whether associations between individual/spousal depression and health vary by culture. I drew on two samples of older adults---5,688 couples from the Health and Retirement Survey (HRS; N=11,376 individuals; M_{age}= 60.43, SD= 11.66) and 2,746 couples from the Chinese Health and Retirement Longitudinal Survey (CHARLS; N= 5,492, M_{age}= 56.97, SD= 8.76). We used the Actor-Partner Interdependence Model to examine *actor* and *partner*effects of depression on self-reported health in older married couples. More depressive symptoms were associated with worse health for individuals. The magnitude of associations between actor/partner depression and health were consistent across the U.S. and China. The current study highlights the importance of examining psychological characteristics of both individuals and their partners and demonstrates the universal properties of dyadic relationships.

MISOGYNY AND VIOLENCE AGAINST WOMEN IN GAME OF THRONES
Taylor Hopper
Category & Time: Social Sciences, Section 7, 2:30 - 3:45 PM
Poster: 400
Mentor(s): Christina DeJong

This study aims to assess the degree of misogyny and violence against women in the Game of Thrones novels as compared to the televised series on HBO. Researchers coded the novels and televised episodes identifying incidents of physical violence against women, sexual violence against women, and derogatory terms aimed at women; then compared the content between the written and televised versions. Initial coding has revealed several common themes in the portrayal of women in a misogynist culture.

PRESENTER INDEX

Student presenters are listed alphabetically by last name.

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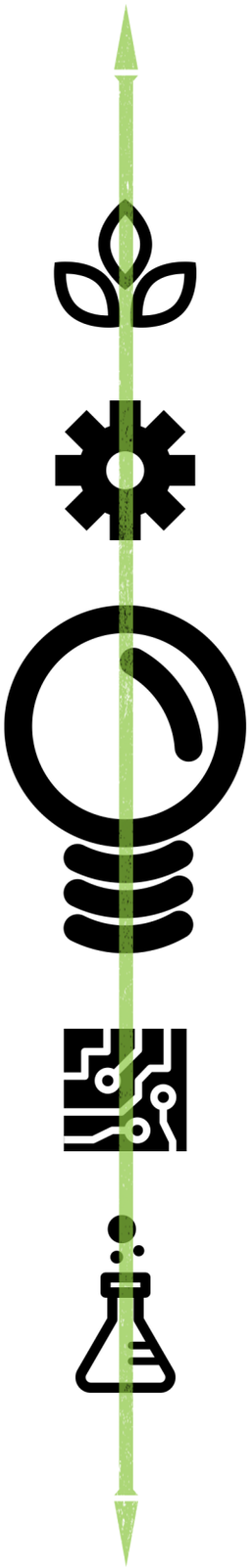

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