MICHIGAN STATE UNIVERSITY

Mid-SURE

MID-MICHIGAN SYMPOSIUM FOR UNDERGRADUATE RESEARCH EXPERIENCES

7.27.2016

WELCOME

Thank you for attending the 2016 **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 370 students from 118 different institutions are participating in today's event. These students are mentored by 359 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
Assistant Director, Undergraduate Research

Korine Wawrzynski
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Director, Undergraduate Research

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Cover image designed by Erin Hollerback '16, BFA Graphic Design.

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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 & INTERNSHIP IN GLOBAL ENGINEERING AND ADVANCED RESEARCH

The Michigan State University College of **Engineering sponsors two summer programs, EnSURE and inGEAR, which are** 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 & inGEAR, 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 Registration	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	3
Biochemistry & Microbiology	1 , 2, 3, 4, & 5	6, 7, 8, 9, & 10
Biosystems & Agricultural Engineering	1	2
Cell Biology, Genetics, & Genomics	1, 2, 3, & 4	5, 6, 7, & 8
Chemical Engineering & Materials Sciences	1 & 2	3 & 4
Civil & Environmental Engineering	1	2
Computer Science & Engineering	1 & 2	3 & 4
Electrical & Computer Engineering	1 & 2	3 & 4
Environmental Sciences & Natural Resources	1	
Epidemiology & Public Health	1	2
Integrative Biology	1 & 2	3 & 4
Mechanical Engineering	1 & 2	3 & 4
Physical & Mathematical Sciences	1 & 2	3 & 4
Social, Behavioral, & Economic Sciences	1 & 2	3, 4, & 5

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
Case Western Reserve University	Department of Biochemistry
Michigan School of Professional Psychology	Office of Admissions
Michigan State University	College of Engineering
Michigan State University	The Graduate School
Michigan State University	Kinesiology
Michigan State University	School of Criminal Justice
Michigan State University	School of Human Resources & Labor Relations
Michigan State University	School of Pharmacology & Toxicology
Michigan Technological University	The Graduate School
Northwestern University	McCormick School of Engineering & Applied Science
Purdue University	The Graduate School
University of Kansas	Self Graduate Fellowship
University of Michigan	School of Public Health
Van Andel Institute	PhD Graduate Program
Wayne State University	The Graduate School
Western Michigan University	The Graduate School

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

DO DIFFERENT AGRICULTURAL PRACTICES AND GENETIC MODIFICATIONS CONCERNING THE SOYBEAN PLANT AFFECT HERBIVORY RESPONSES?
Brianna Benjamin (University of the Virgin Islands)
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:15 PM
Poster: 1
Mentor(s): Maren Friesen (Molecular Plant Sciences), Chandra Jack (Molecular Plant Sciences)

Glycine Max, commonly known as soybean, is a well-known global and important crop. It is considered to contain most of the nutrients needed to sustain a healthy body and is also the most important crop for producing edible oil. Additionally, soybean is the only available crop that provides an inexpensive and high quality source of protein comparable to animal-derived protein, which makes it an essential part of agriculture for many underdeveloped countries. In the U.S., a popular option of soybean seed is called the "Round-up ready," produced by Monsanto Industries and genetically modified to withstand the effects of "Round-up" herbicide. By this simple act of modification, the Soybean Plant expresses certain genes slightly differently than a non-roundup ready plant, and this may be enough to elicit a feeding preference in certain herbivores, namely the Soybean Looper and Velvetbean Caterpillar. In fact, according to Ipm.ncsu.edu, caterpillars , "under high populations, can strip an entire field." [of soybean plants.] Therefore, I hypothesize that if agricultural practices are varied/ altered, then this will elicit a feeding preference from these herbivores. To support my hypothesis, I will utilize both Roundup Ready and Non Roundup Ready (Organic) soybean seeds, and modify the conditions under which they are grown accordingly over a period of 3-5 weeks. They will then be fed upon by the herbivores, and data from their feeding will be collected. Information obtained from this study may contribute to the current pool of knowledge on how commercial genetic modifications and agricultural practices affect herbivore feeding preferences, and this information could potentially help agriculturalists choose what variation of Soybean they want to invest in cultivating.

THE EFFECTS OF HUMAN DISTURBANCE ON POPULATIONS OF SPOTTED HYENAS
Elizabeth Bond (Michigan State University)
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:15 PM
Poster: 2
Mentor(s): Julie Turner (Zoology)

With the recent increase in the human population, human disturbance is a growing issue for animals' development. For instance, human disturbance affects spotted hyenas' (Crocuta crocuta) availability of resources, predation risk, and response to intruders, which in turn shapes their individual boldness and survival behaviors over time. Five stages are key to behavioral development among hyenas and provide information on how selection pressures, like human disturbance, shape mammalian behavior during ontogeny. A way to observe the immediate effects of human disturbance, that influence long-term outcomes, is to focus on the transition between the communal-den and den-independent periods because this is a time of high mortality as hyenas learn to survive outside the den. The focus of this study is to discover if there is a difference, due to selection pressures, in den independence between clans of hyenas in anthropogenically disturbed and undisturbed habitats. I hypothesize that hyena cubs born in areas of human disturbance will have earlier integration into adult clans due to the indirect effects of human presence like lesser predation risk associated with humans driving-out larger predators like lions and increased food resources compared to the less-disturbed clans. We calculated the date of den independence for each individual hyena using data collected in the past eight years. I compared the ages of hyenas who became independent in undisturbed areas to hyenas that became independent in disturbed areas. This comparison highlights how indirect effects of human disturbance can have a huge impact on animals' development and survival.

ADDITION OF GALLIC ACID AS A PROTECTANT AGAINST ANTHOCYANIN AND COLOR DEGRADATION IN VITAMIN C FORTIFIED TART CHERRY JUICE
Arrieyana Cartier (Virginia State University), Zully Perez (University of Nebraska-Lincoln)
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:15 PM
Poster: 3
Mentor(s): Kirk Dolan (Food Science & Human Nutrition and Biosystems & Agricultural Engineering), Sunisa Roidoung (Food Science & Human Nutrition), Muhammad Siddiq (Food Science & Human Nutrition)

The color quality of juices from pigment-rich fruits undergoes deterioration during extraction, processing, and storage. Vitamin C fortification in juice prevents oxidation and enhances nutritional levels, however, it can also degrade the color of pigment rich juice by oxidizing anthocyanins in the juice. It is theorized that byproducts from vitamin C oxidation, especially hydroxyl radicals, play a vital role in anthocyanin degradation resulting in the color quality. Gallic Acid has been reported as a potential antioxidant to mitigate the anthocyanins degradation. Therefore, the objectives of this study are to determine the effect of temperature and vitamin C fortification on anthocyanins and color degradation in tart cherry juice, and to validate the protective effect of gallic acid against the detrimental effect of vitamin C fortification. Montmorency tart cherry juice concentrate is used in this study. The 15x diluted juice was fortified with different vitamin C levels from 0 to 100 mg/100 mL, 300 mg/100 mL of gallic acid added, then pasteurized for 1 minute at 75°C, 85°C, and 95°C. Juice was analyzed for total anthocyanin, total phenolic content, red color intensity, and browning index. Data was analyzed for significant differences using one-way analysis of variance (ANOVA) at significant level < 0.05. Decreased levels of anthocyanin and red color intensity were observed with increased concentrations of vitamin C fortification and

pasteurization temperature. Gallic acid reduced color degradation and browning index significantly with pasteurization at 85°C and 95 °C, but was not effective at reducing anthocyanin degradation with the treatments in this study.

EFFECT OF LIGHT INTENSITY ON ALGAL BIOMASS ACCUMULATION
Carly Daiek (Michigan State University)
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:15 PM
Poster: 4
Mentor(s): Wei Liao (Biosystems & Agricultural Engineering), Yan Liu (Biosystems & Agricultural Engineering), Yingkui Zhong (Biosystems & Agricultural Engineering)

Microalgae exhibit several advantages for bioenergy production and will become increasingly valuable as fossil fuels continue to deplete. Microalgae convert solar energy to produce bioenergy at a high efficiency thus requiring less area for cultivation compared to other crops. Algal biomass can also be used in the production of various items such as fish feed and cosmetics. However, several major technical challenges on large-scale algal cultivation hinder commercial algal fuel and chemical production. Such challenges include low biomass productivity and high operating costs of biodiesel production. It has been shown previously that light intensity is one of the main limiting factors effecting the accumulation of biomass. Therefore, the objective of this study was to investigate the effects of light intensity on algal cultivation in order to increase production efficiency. Implementation of the experiment involved the utilization of red and blue LED lights with adjustable intensity and microalgae cultivation at high and low CO2 levels using a carbon dioxide reactor and regular Erlenmeyer flasks. Samples were taken daily for a period of 7 days to investigate kinetics of cell growth and nutrient utilization under different culture conditions. Statistical analyses were conducted to compare the differences between treatments to select the best cultivation condition(s).

THE POTENTIAL MECHANISM OF PH DECLINE IN PALE, SOFT, AND EXUDATIVE TURKEYS UNDER HEAT STRESS CONDITIONS
Tyler Huff (Alabama A&M University)
Category & Time: Agriculture and Animal Science, Section 2, 1:00 PM - 2:15 PM
Poster: 8
Mentor(s): Walid Aljarbou (Food Science and Nutrition), Gale Strasburg (Animal Science)

Turkeys intolerance for hot temperature climates, have triggered a pH decline in the muscle due to a higher velocity in postmortem glycolysis. The acceleration is due to a switch from oxidative to anaerobic respiration that produces lactic acid while the live turkey is under heat stress. The concentration of lactic acid in the muscle will cause the proteins to denature resulting in a pale color, soft gelatin texture, and an exudative purge(PSE). The PSE condition is a significant concern due to an economic loss of 200 million dollars per year in the turkey industry. The objective of this research is to identify the abnormal factor that accelerates the postmortem pH decline. We hypothesize that during heat stress conditions, the turkey has a low intensity of pyruvate dehydrogenase kinase(PDK4) enzyme discovered by previous research. The function of these enzymes is phosphorylate pyruvate dehydrogenase(PDH) to sustain aerobic respiration. Our experimental design consists of breast muscle samples from 12 different turkeys to retrieve all the proteins from the muscle. The next step is to separate the proteins and pinpoint PDK4 enzymes of interest with an image display. Once we have a visual image of our targeted protein we will using a computer program to measure its intensity to differentiate between PSE and a normal turkey product. We anticipate the research will give us understanding of the PSE mechanism so we can further push for a necessary turkey diet that will help them adapt to the heat stress in their farm environments.

USING EMERGENCE TRAPS TO MONITOR NESTING PREFERENCES OF PARASITOID WASPS IN AGRICULTURAL LANDSCAPES
Shiala Naranjo (University of Central Florida), Erin Forster (Michigan State University)
Category & Time: Agriculture and Animal Science, Section 2, 1:00 PM - 2:15 PM
Poster: 9
Mentor(s): Julia Brokaw (Entomology), Rufus Isaacs (Entomology), Jason Gibbs (Entomology)

Natural areas surrounding farms provide habitat for a wide range of natural enemies that parasitize crop pests however, increasing agricultural intensification has simplified landscapes and caused a rapid decline in farmland biodiversity. Parasitoid wasps are important predators in agricultural landscapes and provide critical pest management services for economically valuable crops. However, relatively little is known about the life history of wasp communities, despite their economic importance and use in integrated pest management programs. Providing enhanced patches of habitat containing perennial wildflowers is a well-documented approach to attracting numerous beneficial insects to the flowering patch for resources. In Michigan, Japanese beetles, a pest of small fruit, are widespread because of abundant turf for larval growth and lack of natural enemies. Wasps belonging to the genus Tiphia have been shown to parasitize Japanese beetles at high rate. In order to document how various habitats in and surrounding farmland impact reproduction of Tiphia, 40 60 cm2 emergence traps were placed four habitat treatments: wildflower plantings, woodlots, grassy margins, and within blueberry fields. Traps were placed at dusk at three farms simultaneously and three rounds of sampling were conducted at each farm. Abundance of Tiphia were determined and compared between habitats. Our results will guide management strategies on preserving natural areas surrounding farmland and provide recommendations for integrated pest management strategies for beetle pests.

STUDY OF SAPOGENIN IN YOKU SACHIDEGERA
Kshitij Kumar (North Carolina Central University)
Category & Time: Agriculture and Animal Science, Section 2, 1:00 PM - 2:15 PM
Poster: 10
Mentor(s): John Buchweitz (Diagnostic Center for Population of Animal Health)

Saponins are chemical compounds derived from Yucca Schigidegera. These compounds have been utilized as natural product feeding additives for the reduction of noxious gases generated by ruminants. The plant driven compound are suspected to accomplish this through defaunation of the rumen. The primary difficulty with using natural products, though, is controlling saponin content and quantity from one lot to the next. Therefore, the objective of this study was to evaluate the utility of gas chromatography tandem mass spectrometry (GC-MS/MS) as an instrumental technique for detecting and quantifying saponins with greater specificity than preexisting spectrophotometric techniques. It is demonstrated that GC-MS/MS provides a reproducible "fingerprint" of saponin extracts, thus serving as an excellent technique for product quality control. Furthermore, with the use of an internal standard, GC-MS/MS also provides superior quantification of the individual and total saponins when compared to the spectrophotometric technique alone.

WHY ARE GRASSHOPPERS SO HARD TO CATCH? THE VISUAL NEURONS UNDERLYING THE INSECT'S ESCAPE MECHANISM
Dieu My Nguyen (University of Arizona)
Category & Time: Agriculture and Animal Science, Section 2, 1:00 PM - 2:15 PM
Poster: 11
Mentor(s): Greg Gage (Neuroscience)

This study aimed to record and analyze the descending contralateral movement detector (DCMD) neurons extending from the optic lobe to the methothoracic ganglia of the grasshopper and underlie the animal's motor sensitivity to approaching visual cues. In the natural environment, this visual and motor response serves as an escape mechanism for the grasshopper, a prey for a variety of animals including birds and larger insects. Based on literature research on locust vision, the hypothesis of this project was that the DCMD neurons show preferential responses to objects that are approaching the eye rather than objects receding from it, and that the neuronal activity would peak before the object's image reaches its maximum size during the approach. Thus, the neuron's properties control the anticipation of collision and the motor reaction before the time of collision between the grasshopper's eye and the approaching object. This project used Backyard Brains' and do-it-yourself tools to perform extracellular recordings and analysis of the DCMDs' activity to contribute to the existing literature on insect vision neuroscience.

THE AFFECT OF LIGHT AND THE CIRCADIAN CLOCK ON UV-B STRESS SENSITIVITY IN PLANTS
Daphne Onsay (Michigan State University)
Category & Time: Agriculture and Animal Science, Section 2, 1:00 PM - 2:15 PM
Poster: 12
Mentor(s): Eva Farre (Plant Biology)

The circadian clock is a cell autonomous clock that keeps 24-hour time upon which it generates rhythmic outputs that are monitored at the cellular and organismal level. In plants, this clock is involved with signaling pathways that influence how the plant responds to the environment and in daily rhythms that play a role in growth, metabolism, plant fitness, and UV-B radiation. The plant responses to UV-radiation include modification of metabolism, synthesis of a range of secondary metabolites which include the UV-protective flavonoids, reduced extension growth, reduced leaf branching, and growth inhibition. My research looks at how the circadian clock modulates stress responses specifically in UV-B radiation and how the sensitivity of plants varies at different times of the day in response to UV-B radiation. I focused on comparing the degree of growth inhibition in the day and night UV treatments. This study was conducted to determine whether seedlings treated at night were more sensitive to UV-B radiation than seedlings treated during the day and determine which experimental settings exhibit this phenotype. I carried out 3 hour UV treatments during the day and during the night. Once the seedlings completed the treatment, they were placed back into their respective growth chambers for a two-week growth period. Seedling weights were recorded at the end of the two-week growth period.My results indicated the experimental settings that showed how the night UV treatment lead to more damage in the seedlings.

DEVELOPMENT OF TOOLS FOR STUDYING TRIPARTITE PLANT-FUNGAL-BACTERIAL INTERACTIONS
Marian Rodriguez-Soto (University of Puerto Rico Mayaguez Campus)
Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM
Poster: 16
Mentor(s): Gregory Bonito (Plant, Soil & Microbial Sciences), Natalie Vande Pol (Microbiology & Molecular Genetics)

Some microbial organisms are significant in agricultural systems as they can promote productivity and soil health. Fungi from the genus Mortierella are one such beneficial fungus. These fungi are found in plant roots as endophytes, promoting plant growth, and in soils as saprotrophes involved in soil N-cycling. These fungi are also commercially important because they can produce economically important lipids. Within the hyphae of different species of this genus, four phylotypes of bacteria known as Glomeribacter Related Endobacteria (GRE) have been identified. The role of these endobacteria on fungal and subsequent plant interactions is still an enigma. Our goal is to develop tools for studying the interactions between the bacteria, fungi and plants using the moss, Physcomitrella patens. To accomplish this, we will culture and transform the four phylotypes of endobacteria to express green fluorescent protein (GFP) and reintroduce them into the fungi. We will also transform several species of Mortierella to express GFP, using Agrobacterium tumefaciens mediated transformation, selecting for successful transformants using fungicide resistance. Mortierella with and without the endobacteria will be co-cultivated with P. patens to observe the interactions between the moss and the fungi. Through these tools, we aim to discover, the mode of endobacteria transmission, the molecular and genetic basis of the life cycle and the evolutionary ecology of tripartite bacterial-fungal-plant symbioses.

INVESTIGATION OF ISOPRENE EMISSION, PHOTOSYNTHESIS, RESPIRATION AND GROWTH IN ARABIDOPSIS THALIANA EXPRESSING EUCALYPTUS GLOBULUS ISOPRENE SYNTHASE
Lydia Sanchez (Michigan State University)

Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM
Poster: 17
Mentor(s): Sarathi Weraduwage (Biochemistry)

Isoprene synthase (IspS) is an enzyme that is responsible for the production of isoprene which is a volatile hydrocarbon produced by trees such as Eucalyptus, Salix, and Populus. The role of isoprene emission is still somewhat unknown. However, research has shown that isoprene may play a role in abiotic stress tolerance. The current project investigated the effects of IspS expression on isoprene synthesis, plant growth and physiology, and alterations to products of the methylerythritol 4-phosphate pathway. A control line of Arabidopsis thaliana carrying the empty vector and transgenic lines ISPS B2-5C and ISPS C1-4-1 expressing a Eucalyptus IspS gene, was grown in growth chambers in a hydroponics system. The hydroponics medium used was ½ strength Hoagland's solution, and plants were grown under the following conditions: a light intensity of 120 µmolm⁻²s⁻¹; an 8 h photoperiod, daytime temperature of 23ºC and nighttime temperature of 20ºC, and 60% relative humidity. Growth measurements were taken throughout the lifecycle in intervals of 3 weeks and included measurements of projected and total leaf area, and leaf, root, and inflorescence dry weights. Photosynthesis and respiration, isoprene emission, carbon partitioning, chlorophyll and protein concentration were also measured. We hope to use these measurements to gain a better understanding of the effects of genetically engineering Arabidopsis to express IspS on photosynthesis, respiration and growth. Implications on crop improvement will also be discussed.

ZOMBIE SNAILS: MINDLESS METHODICAL MOVEMENT
Nancy Sloan (Virginia Tech)
Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM
Poster: 18
Mentor(s): Greg Gage (Neuroscience)

Have you ever thought about the concept of walking or breathing, how our steps are always the same? How about a snail that so rhythmically moves across a tank eating algae? Did you ever take a minute to wonder how our brains are able to so easily and naturally create these rhythms? Unless you're London Tipton, you're probably not continually thinking "breathe in, breathe out" or "left, right, left, right." There are groups of neurons called ganglions that act as central pattern generators (CPGs), which are neural networks that regulate rhythmic movements like breathing, walking, or chewing so we can save room for higher-order thoughts. In order to test this, Lymnaea stagnalis pond snails were looked at to view their buccal CPG in action. This CPG controls any rhythmic movement related to the mouth, which for this experiment was primarily rasping, or scraping with the radula – a tongue covered in teeth, for behaviors of eating and laying eggs. This was tested by anesthetizing the snail, making an incision below the mouth, implanting an electrode around the neuron that stems into the lateral and ventral buccal nerves, hooking up the electrode to the Backyard Brains SpikerBox, allowing the snail to heal, then observing the behaviors of eating and egg laying in both physical activity and electrical activity, mainly seen as spikes in the SpikeRecorder software. Through this research, we are better able to understand how central pattern generator networks operate in the human brain.

AN INVESTIGATION OF RIN4 PHOSPORYLATION IN PLANT IMMUNITY
Elizabeth Umanah (University of Georgia)
Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM
Poster: 19
Mentor(s): Brad Day (Plant, Soil & Microbial Sciences), Yi-Ju Lu (Plant, Soil & Microbial Sciences)

RPM-Interacting Protein 4 (RIN4) is an essential regulator of plant defense in the model Arabidopsis - Pseudomonas pathosystem. This protein serves its role by activating both effector- and pathogen-associated molecular patterns (PAMP)-triggered immunity (ETI and PTI) through being phosphorylated. Current work in our lab has identified two kinases that interact with RIN4. The research being conducted seeks to understand the mechanisms behind the interaction of each kinase with RIN4 by examining if phosphorylation will occur at specific residues on RIN4. This will be done by performing an in-vitro kinase assay. To elucidate the role of RIN4 phosphorylation, we will assess the presence of the hypersensitive response (HR) by co-infiltrating a bacterial effector and RIN4 phosphomimetic proteins into the plant Nicotiana benthamiana. The results of the experiment will allow us to understand how these two kinases interact with RIN4 and also how the two kinases interact with each other. With this, the mechanism behind RIN4's plant immune regulation will be determined.

PRODUCTION OF CHITIN AND LACTIC ACID RICH FERTILIZER FROM CULL POTATOES FOR POTATO DISEASE CONTROL
Shuman Zhang (Michigan State University)
Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM
Poster: 20
Mentor(s): Yan Liu (Biosystem Engineering)

A variety of pathogen can attack potatoes and cause a dramatic reduction of the production. Preventing these infections is critical to ensure the healthy growth of potatoes and improve the production. Preventing these infections is critical to ensure the healthy growth of potatoes and improve the production. It has been reported that some natural polymers (such as chitin/chitosan) can act as vaccines for plant disease control. In addition, adjusting soil pH has also been used to prevent potato diseases. On the other hand, cull potato is a waste stream from potato industry. Management of cull potato disposal is very important to a healthy potato production since improperly handling of cull potatoes could lead to some severe disease and negative environmental consequences. Therefore, the objective of this study is to develop a solid state fungal fermentation process for chitin and lactic acid rich fertilizer production from cull potatoes. Different amount of cull potatoes (300g, 400g,600g potatoes) were mixed with cover stover as the production medium. A filamentous fungus *Rhizopus oryzae* cultured on potato dextrose broth (PDB) medium was inoculated on production media and cultured at 30 °C for 3 days. The total biomass was then dried at 65 °C for 24 hours in a tray dryer and collected as the fertilizer. The production yield and contents of chitin and lactate in final product were measured and compared to conclude the best culture condition.

HOW DOES THE PRESENCE OF RHIZOBIA AND HERBIVORES INFLUENCE RAPID EVOLUTION AND INVASIVE PLANTS?
Lauren Smythe (Pacific University)
Category & Time: Agriculture and Animal Science, Section 3, 2:30 PM - 3:45 PM

Poster: 21
Mentor(s): Chandra Jack (Plant Biology), Shawna Rowe (Plant Biology)

Presence of invasive species demonstrates climate change and changing ecosystems; climate change causes longer seasons allowing the invasive species more time to spread and conquer native species, changing the ecosystem. Medicago Polymorpha can be found all over the world, though it is native to the Mediterranean basin. Sixteen genotypes were selected, eight native species, and eight invasive species. The presence of rhizobia and herbivory will be analyzed to determine their influence on rapid evolution and invasive plants. I hypothesize that invasive Medicago Polymorpha with rhizobia will be healthier than the plants with no nitrogen or rhizobia, and the herbivores will prefer the M. Polymorpha that are native because a majority of the selected herbivores are from an invasive range and therefore native plants will not have adapted a strong enough defense system to reduce herbivory. Preliminary evidence has shown that in Medicago herbivores have already influenced evolution because the plant has a defense system against caterpillar saliva. The research question will be assessed through a variety of treatments, first, rhizobia treatment: introduction of a mix of three native and three invasive rhizobia, or no rhizobia in order to identify differing characteristics, mixture of rhizobia added will create differences between plant characteristics as well, so rhizobia present in each plant will be identified. The second treatment, herbivory treatment, will introduce caterpillars for defense priming, weight before and after plant consumption is tested to identify plant preference, then herbivores are introduced a second time to better see plant defense. Before herbivory leaf area will be logged, post-herbivory root and shoot mass will be collected, as well as nodule numbers.

BIOCHEMISTRY & MOLECULAR BIOLOGY

SEX DIFFERENCES IN DRUG RESPONSES OF THE MOUSE COLON
Abneil Alicea Pauneto (University of Puerto Rico at Cayey)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 24
Mentor(s): James J Galligan (Pharmacology & Toxicology)

The enteric nervous system (ENS) is a complex and independent network embedded in the gut walls that controls autonomous gastrointestinal function from the direct connections with the central nervous system. Understanding the ENS physiology will help us develop better approaches to counter attack diseases as Irritable Bowel Syndrome (IBS), a chronic gastrointestinal disease. The gastrointestinal disorder IBS generates abdominal pain and alters bowel habit producing visceral hypersensitivity, with an unknown cause, affecting 10-15% of the US population. The present study seeks to identify sex differences in wild type mice treated with BETH, 5-HT and ACh, in mouse colon, this to further expand our knowledge on gut physiology and the etiology of IBS. Our experimental procedure consist of comparing, male and female colon motor reflexes by isometric tension isolated organ bath, migrating myoelectric complex and fecal output assay. These techniques allow us to measure changes in muscle propulsion between genders, where multiple neuronal populations simultaneously synchronize to regulate the mechanism that govern gut motility. For comparison, we will also study tryptophan hydroxylase 1 (the enzyme that synthesized 5-HT) KO mice sex differences, during different drug treatments. Taking this into account, our investigation attempts to generate a possible explanation to the current findings that two of three people with IBS disease are women.

MOLECULAR BIOMARKERS FOR EARLY DETECTION OF CEREBRAL PALSY
Brooke Armistead (Grand Valley State University)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 25
Mentor(s): Sok Kean Khoo (Cell & Molecular Biology), Madeleine Lenski (Epidemiology & Biostatistics), Nigel Paneth (Epidemiology & Biostatistics)

Cerebral palsy (CP) is a neurological disorder that occurs during early childhood, with patients showing permanent dysfunctions in their motor skills. The cause of CP is unclear and it is believed that CP arises due to complications during fetal growth and development or during labor. Diagnosis for CP is most common around age 2-4, based on MRI brain imaging and clinical observations from a physician. There is no cure for CP and treatment such as physiotherapies can improve a child's capabilities. Previously, we used archived neonatal blood spots to investigate gene expression between healthy controls and CP patients. Here, we aim to evaluate the gene expression of tyrosine hydroxylase (TH) and S100 calcium binding protein A9 (S100A9) from the asphyxia and inflammatory pathways to differentiate CP from healthy controls. These genes may serve as potential biomarkers for early detection of CP to allow intervention at an earlier age.

CHARACTERIZING ALS: BEHAVIORAL AND MOLECULAR DYSFUNCTION IN SOD1 MUTANT MICE
Shantee Ayala-Rosario (Inter American University of Puerto Rico)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 26
Mentor(s): Jordan Bailey (Pharmacology & Toxicology)

Amyotrophic Lateral Sclerosis (ALS) is a progressive and fatal disease. Its sporadic form (sALS) has currently no known etiology; therefore, animal models are used to explore the possible causes of ALS and how ALS disrupts normal biological processes. Motor function will be measured across the lifespan of animals that have an ALS-like genotype. The phenotype begins presenting itself in $SOD1^{G93A}$ mice by hind-limb dysfunction and later progresses into paralysis, in addition to difficulties with balance and coordination. By using two gait analysis systems motor impairment will be characterized in this animal model carefully as the mice age from their young stage (pups) until the phenotype begins to present itself (approximately 8 weeks), and also verify which motor task is more sensitive and precise to the physical effects of the ALS phenotype. To obtain such results, two discrete motor tasks will be used: Rotarod and DigiGait. Furthermore, qPCR (quantitative polymerase chain reaction) will be utilized to verify if the neurotoxicant Methylmercury affects AMPA receptors. By carrying out this study, the main focus is the characterization of genetic and environmental contributions to ALS by using both biomolecular and behavioral endpoints in the mouse model. Therefore, the data generated here will be useful evidence to the gene-environment (GxE) interactions believed to contribute to ALS meaning that there is a possibility that exposure to toxic pollutants can contribute to the attainment of the sporadic form of this disease.

CHARACTERIZATION OF MEHG-INDUCED ALTERATIONS IN GLUTAMATE RECEPTOR SUBUNIT EXPRESSION IN NSC34 AND HIPSC-MN CELL LINES
Jenna Baker (Illinois Wesleyan University)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 27
Mentor(s): Alexandra Colon-Rodriguez (Pharmacology & Toxicology)

The ionotropic glutamate receptors AMPA and NMDA mediate fast excitatory neurotransmission. RNA editing and subunit composition cause the AMPA receptor to vary in Ca^{2+}permeability, while the NMDA is always Ca^{2+} permeable. Methylmercury (MeHg), a persistent environmental neurotoxicant, causes increased intracellular Ca^{2+} $[Ca^{2+}]_i$, which lowers the ability for motor neurons to handle oxidative stress, leading to a cascade of events that result in cell death. MeHg-induced alterations in $[Ca^{2+}]_i$ are mediated in part by AMPA and NMDA. Herein work seeks to determine if MeHg-induced alterations in AMPA and NDMA receptor expression contributes to increased Ca^{2+}permeability, increased $[Ca^{2+}]_i$, and ultimately causes cell death. In order to understand MeHg-induced toxicity in motor neurons, AMPA and NMDA receptor expression and subunit composition were measured by quantitative real time qPCR in NSC34-MN and hiPSC-MN cell lines after 24 and 48 hours of exposures to MeHg at 0.5, 1.0 and 1.5 mM concentrations. Based on previous research using spinal cord cultures or *in vivo* murine studies, neuronal cell death via Ca^{2+}calcium-mediated pathways is seen as a result of MeHg exposure. Anticipated results include modifications in the AMPA and NMDA receptor expression in NSC34-MN and hiPSC-MN cell lines, which would increase Ca^{2+} permeability and $[Ca^{2+}]_i$. This would suggest a consistency in MeHg-induced toxicity in both cell lines and will allow us to identify the mechanism by which these receptors are contributing to MeHg-induced cell death in motor neurons.

EXOGENOUS PROTEIN STIMULATES BIOFILM FORMATION BY SELECT FRESHWATER BACTERIA
Lekha Bapu (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 28
Mentor(s): Terence Marsh (Microbiology & Molecular Genetics)

Biofilm consists of a community of cells that are held together by a matrix of macromolecules. Most bacteria are thought to be associated with biofilm during some part of their lifecycle. Biofilm can form on a variety of surfaces including food manufacturing equipment and invasive medical devices. Previous studies have drawn attention to the ability of biofilm to confer increased antibiotic resistance and protection from external stressors. Investigations into how environmental stimuli influence its formation have relevance to wastewater treatment, as well as the food industry and healthcare. Our objective was to screen 96 Triclosan-resistant isolates from the Red Cedar River for their ability to form biofilm under several conditions. These strains include potential opportunistic human pathogens and fish pathogens. We found that a substantial proportion of these isolates display enhanced biofilm formation in the presence of exogenous protein. Further studies will titrate the effect of different protein concentrations on biofilm formation using a spectrophotometric assay. Changes in biofilm architecture will be analyzed by quantitating and visualizing protein in the extracellular matrix using a variety of methods, including microscopy and gel electrophoresis.

THE EFFECTS OF METHYLMERCURY EXPOSURE ON THE SOD1 G93A MOUSE MODEL WITH THE PROGRESSION OF ALS
Brooke Brauer (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 29
Mentor(s): Jordan Bailey (Pharmacology & Toxicology)

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that causes loss of motor function and affects the central nervous system. The SOD1 G93A mouse model is frequently used to investigate the cellular, molecular and behavioral alterations associated with ALS. Two hypothesis are tested, first that SOD1 G93A mutant mice exhibit subtle motor function decay earlier in development than that which can be detected via visual inspection. Here, we quantified distinct parameters of motor function, including gait analyses, coordination and balance, in an effort to determine the most sensitive marker(s) of motor dysfunction in SOD1 mutants. The second hypothesis is that an environmental event, like exposure to methylmercury (MeHg), in the presence of the SOD1 mutation will act synergistically to cause changes in AMPA receptor expression in spinal cord tissue. Motor function in male and female mice ranging in age from 30 days to 4 months was quantified using rotarod and digigait. After acclimation, animals ran on the rotarod from 0-40 rpm over the course of 120 seconds and ran on the digigait for 3 minutes. Various parameters of motor function were measured. For the biomolecular assays, sections of spinal cord (lumbar region) were exposed to MeHg (20 uM) for 10 minutes, then qPCR was performed. The data collected will provide valuable information for understanding 1) the subtle progression of motor impairment in SOD1 G93A mutants over the course of development and 2) the role of gene environment interactions in contributing to the development of an ALS phenotype.

MOLECULAR BASIS OF COMPLEMENT FACTOR H RECRUITMENT BY THE LYME DISEASE PATHOGEN BORRELIA BURGDORFERI
Yizhou Huang (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 30
Mentor(s): Honggao Yan (Biochemistry & Molecular Biology)

Many human pathogens have strict host specificity, which affects not only their epidemiology but also the development of animal models and vaccines. Complement factor H (FH) is recruited to Borrelia Burgdorferi cell surface in a human-specific manner via the bacteria protein virulence factor called CspA family protein. In the present study, we show that a single human FH (hFH) domain is sufficient for tight binding of CspA, present the crystal structure of the complex and identify the critical structural determinants for host-specific FH recruitment. We also identified the residues in hFH that are important for binding CspA by using mutagenesis and Isothermal Titration Calorimetry.

EFFECT OF INCREASED METABOLIC EFFICIENCY ON BIOFUEL PRODUCTION AND GROWTH IN ZYMOMONAS MOBILIS
Kathryn Brittain (Middle Tennessee State University)
Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 32
Mentor(s): Michaela TerAvest (Biochemistry & Molecular Biology)

Zymomonas mobilis is an anaerobic bacterium and a research focus for the Great Lakes Bioenergy Research Center as a potential aid in replacing environmentally harmful fuels with biofuels. It is known for its high-yield production of ethanol, a biofuel, from the Entner-Doudoroff (ED) pathway. The ED pathway is an inefficient glycolytic pathway generating one ATP per glucose rather than two ATP. This lack of energy may be the cause of the low growth yield of Z. mobilis, another benefit for its use in biofuel production. Therefore, we will express three non-native genes in Z. mobilis (pta, ackA, and mhpF) to better understand the relationship between ATP yield, ethanol production, and growth. These genes will allow acetate production from acetyl-coA and acetaldehyde, increasing the ATP yields in Z. mobilis to three ATP per glucose. We will first insert the genes into plasmids, and transform the plasmids into E. coli cells. To verify proper assembly, the plasmids will be isolated and sequenced using Sanger sequencing. If the sequencing results prove correct, the plasmids will be inserted into Z. mobilis. Modified Z. mobilis strains will be isolated and undergo phenotypic analysis to determine how the addition of these genes alters growth and ethanol production. We expect to see a decrease in ethanol production, with an increase in cell counts. This project will help identify specific genes that may be deleted from other microorganisms to recreate the low-biomass, high-ethanol yield of Z. mobilis in other systems.

CHARACTERIZATION OF RESIDUES NEAR THE SPOIVFB ACTIVE SITE THAT MEDIATE REGULATED INTRAMEMBRANE PROTEOLYSIS OF PRO-σK DURING BACILLUS SUBTILIS SPORULATION
Fiona Buchanan (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 33
Mentor(s): Lee Kroos (Biochemistry & Molecular Biology), Daniel Parrell (Microbiology & Molecular Genetics)

Under starvation conditions, *Bacillus subtilis* cells divide into asymmetric compartments that experience differential gene expression, resulting in the engulfment of the smaller compartment and the formation of an endospore. An important event in sporulation after engulfment is activation of the transcription factor σ^K in the mother cell due to regulated intramembrane proteolysis of Pro-σ^K by SpoIVFB, an intramembrane metalloprotease (IMMP). IMMPs are regulators of gene expression found in all domains of life; Archaea, Bacteria, and Eukarya all feature similar IMMPs with the active site motif HEXXH that cleave membrane-bound transcription factors. Previous work from the Kroos lab suggests that there are conserved loops either adjacent to, or part of, the SpoIVFB active site. Earlier, I demonstrated that amino acid substitutions in the loop affect cleavage of Pro-σ^K by SpoIVFB upon co-expression in *E. coli.* To further characterize the cleavage of Pro-σ^K by SpoIVFB, I created a plasmid that co-expresses Pro-σ^K with a His6 tag and SpoIVFB with a 2xFLAG tag and features cut sites that allow separation of these two components. Using this plasmid, the effects of four new amino acid substitutions in SpoIVFB on the cleavage of Pro-σ^K will be examined using Western blotting. Next, their effects on interaction between SpoIVFB and Pro-σ^K will be examined using pull-down assays. Progress in these directions will be reported. I hope to elucidate the roles of each residue, facilitating understanding of how intramembrane proteases evolve to interact with their substrates, and to generate knowledge about IMMPs, assisting future research.

TWO IMMUNE CELLS BINDING AND ALTERING BY THE PANCREATIC AMINO ACID C-PEPTIDE
Demarcus Bunn (Concordia University Ann Arbor)
Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 34
Mentor(s): Dana Spence (Chemistry)

RATIONALE: C-peptide is a 31 chain polypeptide produced in the beta cells of the pancreas. Its role is to help form proinsulin. When the bond of proinsulin is broken, a 1:1 ratio of insulin and c-peptide is released. In diabetes treatment, insulin shots are the main form of treatment. However, they do not help ease complications that come with the disease (Neuropathy, Kidney disease). Previous studies have shown that C-peptide binding to red blood cells increase glucose uptake. In diabetes patients, immune cells are slow to eradicating infections due to slower glucose absorption. We hypothesized that C-peptide will bind to T and B cells In Vivo, and will increase glucose uptake.
METHODS: Isolating T-cells and B-Cells is done by magnetic separation. Using flow cytometry, we verify the amount of cells we have in each sample. The concentration of C-peptide we use is 800nm. Using an ELISA IgG kit, we are able to quantify the amount of C-peptide in our samples using a plate reader that reads absorption.
RESULTS: We expect that c-peptide will have a high binding affinity with T and B cells. Future research, will focus on glucose uptake.
CONCLUSIONS: Understanding the relationship with C-peptide and T and B cells is important because those with diabetes and even multiple sclerosis are vulnerable to infections due to slow acting T and B cells.

ABSTRACT INDUCTION OF ΔFOSB FOLLOWING PHYSICAL AND EMOTIONAL STRESS
Darlyn Caraballo (University of Puerto Rico-Arecibo)

Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 35
Mentor(s): Megan Kechner (Physiology), Michelle Mazei-Robison (Physiology)

Depression is a devastating disease and the underlying cellular mechanisms are not well understood. To study this, physical (PS) and emotional (ES) chronic social defeat stress mouse models of depression were utilized. ES has been shown to produce many of the same depressive-like behaviors as PS, but it is currently unknown whether it induces cellular changes similar to those induced by PS, such as induction of the transcription factor △FosB. With this in mind, this project seeks to determine if the induction pattern of △FosB is similar between PS and ES. Adult c57BL/6J male mice were exposed to either daily PS or ES for 10 days. PS mice were placed into the cage of a CD-1 aggressor mouse, and ES mice were placed into the same cage, but physically separated from the CD-1 and PS mouse by a perforated Plexiglas partition. One hour following social interaction testing on day 11, mice were perfused and brains were post-fixed and cryoprotected. Brains were then sectioned and immunohistochemistry was performed for ΔFosB. FosB-positive cells were counted in multiple brain regions including nucleus accumbens, caudate putamen, dorsal and ventral hippocampus, prefrontal cortex and ventral tegmental area. Interestingly, while ΔFosB was similarly induced by PS and ES in some brain regions such as the hippocampus, in other regions such as the prefrontal cortex, only PS increased △FosB expression. This work suggests that different types of chronic stress might produce distinct patterns of ΔFosB induction, potentially indicating different brain circuits mediate these phenotypes.

THE EFFECT OF 5-HYDROXYTRYPTAMINE ON BARRIER PERMEABILITY AND TIGHT JUNCTION FORMATION IN CACO-2 CELL MONOLAYERS
Marian Catalan (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 36
Mentor(s): Elahe Crockett (Medicine), Mark Kadrofske (Pediatrics & Human Development)

Tight junctions between epithelial cells are a critical component of the intestinal barrier and limits an inflammatory response to bacteria and other luminal contents. Serotonin (5-hydroxytryptamine, 5-HT) is a paracrine signaling molecule in the intestine which regulates secretion and motility. Evidence from human and experimental models of colitis suggest that 5-HT also plays an important role in regulating intestinal inflammation. At present, it is unknown whether 5-HT alters barrier permeability and tight junction integrity. 5-HT will increase barrier permeability by altering the formation of tight junctions. Methods: Caco-2 cells (originally derived from human colon adenocarcinoma) will be plated onto a transwell culture system to model the intestinal epithelium. Barrier permeability will be determined using transepithelial electrical resistance and FITC-dextran flux in the presence and absence of various concentrations of 5-HT. Caco-2 cells will also be seeded onto coverslips and the tight junction protein, zona occludins-1, will be analyzed using immunofluorescence staining and western blotting following treatment with 5-HT. Results: We have successfully seeded, grown and passaged Caco-2 cells and will soon perform the specific experiments outlined in Methods. Based on our hypothesis, we anticipate that 5-HT will alter barrier permeability by disrupting the formation of tight junctions. Our results may provide a rationale for pharmacologic manipulation of 5-HT signaling to prevent intestinal inflammatory disease. Support: M.C. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

CHARACTERIZING THE MECHANISMS OF ACTION OF NOVEL CHEMICAL INHIBITORS OF MYCOBACTERIUM SMEGMATIS GROWTH
A'Jah Chandler (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 37
Mentor(s): Robert Abramovitch (Microbiology & Molecular Genetics)

Mycobacterium tuberculosis is the bacterium that causes the infectious disease, tuberculosis. The key feature of tuberculosis disease is the granuloma, which is caused when alveolar macrophages, infected with bacteria, are surrounded by other cells to form a protective barrier in the lung. The granuloma provides a hypoxic and acidic environment that restricts bacterial growth and spread. These two factors cause the bacterium to go into a dormant phase, in which antibiotics do not inhibit them as well. In attempt to further understand the mechanism of action of drugs, our lab is trying to characterize chemical compounds that may inhibit the growth of dormant bacterium. We hypothesize that in a hypoxic environment, the chemical compounds PH003, PH017, and tyrphostin will inhibit the growth of this bacterium. Using the non-pathogenic strain Mycobacterium smegmatis, we will be testing the effect of chemical compounds on dormant M. smegmatis. The dormant M. smegmatis was generated simply by adding a small concentration of the bacteria to a flask, along with growth medium, and sealing the flask so there is no access to oxygen. Bacterial growth consumes the oxygen and causes a gradual onset of hypoxia and bacterial dormancy. We predict that the compounds listed above will selectively inhibit the growth of bacterium in a hypoxic model. Characterizing these chemical compounds may lead to new drugs that can possible shorten the time it takes to treat tuberculosis.

MEHG-INDUCED CYTOTOXICITY THROUGH THE SMOOTH ENDOPLASMIC RETICULUM AND MITOCHONDRIA IN PRIMARY CEREBELLAR ASTROCYTES
Yolimar Colon Lopez (Pontifical Catholic University at Ponce Puerto Rico)
Category & Time: Biochemistry and Molecular Biology, Section 3, 1:00 PM - 2:30 PM
Poster: 40
Mentor(s): Rosa J Jaiman (Pharmacology & Toxicology)

Methylmercury (MeHg) is a neurotoxicant that primarily affects granule cells in the cerebellum. This toxicant produces an increase in internal Ca2+ concentration ([Ca2+]i) that causes neuron death. Previous studies suggest that astrocytes are targeted by MeHg before neurons. Similarly to neurons, changes in [Ca2+]i in astrocytes can occur by Ca2+ release from intracellular stores. The effects of MeHg in the smooth endoplasmic reticulum (SER) and in the mitochondria of astrocytes have never been studied. The aim of this project was to study the effect of MeHg in the SER and the mitochondria, and its relationship with cerebellar astrocytes cytotoxicity. Primary astrocyte cultures from the cerebellum of 7-8 day old C57BL/6 mice were exposed for 3h to 0, 1, 2, or 5μM MeHg. Cytotoxicity was measured 24h after the 3h of MeHg exposure using ethidium homo-dimer and calcein--AM. To determine if astrocyte death was due to an increase in intracellular Ca2+ from SER and mitochondria, both thapsigargin and carbonyl cyanidem-chlorophenylhydrazone (CCCP) were used respectively. It was hypothesized that MeHg affects the SER and mitochondria in cerebellar astrocytes producing cell death. Determining the relationship between MeHg-induced disruptions of intracellular Ca+2 with cell death could help us understand the mechanisms of MeHg toxicity in cerebellar astrocytes. Supported by NSF grant DBI1359302, and NIHgrants R01ES024064 and T32GM092715.

DEVELOPING A METHOD FOR LARGE-SCALE QUANTIFICATION OF PROTEIN TURNOVER
Karolina Czarnecki (Florida Gulf Coast University)
Category & Time: Biochemistry and Molecular Biology, Section 3, 1:00 PM - 2:15 PM
Poster: 41
Mentor(s): Teresa Clark (Plant Biology), Yair Shachar-Hill (Plant Biology)

Protein turnover rates vary in response to stress and at different stages of plant development. Studying the rate at which processes of protein synthesis and degradation occur provides insight into the regulation of many metabolic processes, including cell signaling and maintenance of homeostasis. Using stable isotope labeling and mass spectroscopy, the turnover rates of specific proteins have been studied on a small scale. This project seeks to simultaneously quantify turnover rates of large numbers of plant cellular proteins in non-growing active tissue.A set concentration of deuterium-labeled water is introduced into the medium of hydroponically grown Arabidopsis thaliana. Free amino acids and proteins from mature leaf tissue are extracted at various time points, ranging from hours to days. Extracts are analyzed using mass spectrometry to determine the rate at which the deuterium label is incorporated into amino acids and proteins as they turn over. Using first-order rate equations, alternative models are generated to predict the turnover of amino acid and protein pools. The parameters of these models can be adjusted to statistically match the labelling data. Thus, rate constants and dynamics of turnover are quantitatively determined by fitting models to data sets. In addition to providing information about protein dynamics within a metabolic system, large-scale quantification of steady-state protein turnover rates paves the way for numerous comparative studies. This project seeks to establish a novel toolset for quantification of protein turnover, which would lead to the addition of system-wide turnover measurements to the realm of existing –omics methodologies.

PRODUCTION PROCESS FOR THE COPPER CATALIZED ALKALINE HYDROGEN PEROXIDE PRE-TREATMENT OF WOODY BIOMASS
Gabriel Del Alamo Cardoso de Moraes (UNICAMP - Campinas State University)
Category & Time: Biochemistry and Molecular Biology, Section 3, 1:00 PM - 2:15 PM
Poster: 42
Mentor(s): Aditya Bhalla (Biochemistry & Molecular Biology), Eric Hegg (Biochemistry & Molecular Biology), Gracielou Klinger (Chemistry)

The need for biofuels has become evident due to depletion of fossil fuels and increase of greenhouse gas emissions. Lignocellulose-derived biomass has proven its potential as a feedstock for the fermentation of plant carbohydrates to ethanol. Recalcitrance of woody biomass caused by higher order structures in plant cell walls limit the utilization of the carbohydrates. Pre-treatments to overcome this recalcitrance have included expensive equipment and harsh conditions. Copper catalyzed alkaline hydrogen peroxide (Cu-AHP) pretreatment offers a mild solution by obtaining high sugar yields following enzymatic hydrolysis. The present work seeks to evaluate and develop procedures for the Cu-AHP pretreatment and variations in this process used at the Great Lakes Bioenergy Research Center (GLBRC). Thus far, all of the improvements to the Cu-AHP process have been demonstrated at a lab research scale. The development of a standard operating procedure for the upscaling of the Cu-AHP pretreatment will be carried out to evaluate its efficacy at higher solid loadings and reduced inputs. This involves optimization to obtain comparable sugar yields between the various Cu-AHP pretreatment methods, method development for the use of hydrogen peroxide slow addition, and comparisons of the behavior of different biomass (i.e., switchgrass, red pine, and Ammonia Fiber EXpansion (AFEX) pre-treated corn stover). The Cu-AHP pre-treatment as a production process will enable woody biomass to be easily degraded for biofuels.

CHARACTERIZATION OF VIRULENCE FACTORS OF METAL RESISTANT MICROBIAL POPULATIONS IN LOCAL WATER FILLED TREE HOLE ENVIRONMENTS
Bradley Dillard (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 3, 1:00 PM - 2:15 PM
Poster: 43
Mentor(s): Terrence Marsh (Microbiology)

Our work aims to genotype and phenotypically assay nickel and copper resistant isolates taken from tree hole niches. Water filled tree holes are a preferred spot for certain mosquito species to lay their eggs in many areas around the world. The bacterial community is intimately linked to the success of the larvae as microbial decomposition of leaf material provides crucial nutrients to the larvae. Understanding the bacteria in the niche will lead to a better understanding of the mosquito lifecycle and potentially offer solutions to the spread of deadly viruses. We initially isolated strains from water samples collected from a local tree hole onto nickel or copper resistance places. Over the course of a few weeks, we performed various phenotypic assays by replica stamping micro titer plates from inoculation plates. These assays included presence of

extracellular protease on Casein nutrient agar, hemolysis capability on blood agar, motility capability on semi-solid motility agar, Congo red agar to test for biofilm virulence and tested for three antibiotic resistances on antibiotic containing agar. We performed a quantitative biofilm assay, gel electrophoresis for Type III secretion genes among other virulence genes, and had each isolates 16S rRNA sequenced. This presentation will aim to overview the trends of virulence factors found in the metal resist isolates to offer a better understanding of the microbial population within the tree hole.

TROPANE ALKALOID BIOSYNTHESIS AND DIVERSITY WITHIN SOLANACEAE
Tiffany Feebish (Wayne State University)
Category & Time: Biochemistry and Molecular Biology, Section 3, 1:00 PM - 2:15 PM
Poster: 44
Mentor(s): Cornelius Barry (Horticulture), Matt Bedewitz (Horticulture)

Tropane alkaloids (TAs) are a class of medicinally important plant specialized metabolites that includes the narcotic cocaine and the pharmaceuticals, hyoscyamine, and scopolamine. Approximately 200 distinct tropane alkaloids are known and much of the chemical diversity is achieved through the formation of esters formed between bicyclic tropane alcohols and various aliphatic and aromatic acids. The enzymes that catalyze the formation of these esters are largely unknown. The aliphatic tropane ester pool in Atropa belladonna (Solanaceae) is dominated by tigloyl pseudotropine and acetyl pseudotropine and their formation is catalyzed by the BAHD acyltransferase PSEUDOTROPINE ACYLTRANSFERASE (PTR-AT). Putative orthologs of PTR-AT are present within the genomes of multiple members of the Solanaceae family, including those not known to synthesize tropane esters such as tomato and petunia. This research project will investigate the biochemical function of putative PTR-AT orthologs of petunia and tomato to determine whether their function is conserved. Virus-induced gene silencing will also be utilized to determine function of the putative PTR-AT ortholog of petunia. Lastly, diverse species that span the phylogeny of the Solanaceae family will be screened for the presence of tropane esters to determine the distribution of these specialized metabolites across the family. These data will provide insight into the biochemical evolution of specialized metabolism within the Solanaceae.

EXPRESSION AND CHARACTERIZATION OF A FLAVODOXIN DESIGNED FOR ENCAPSULATION WITHIN SYNTHETIC BACTERIAL MICROCOMPARTMENT SHELLS
Ciara Fromwiller (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 47
Mentor(s): Cheryl Kerfeld (Biochemistry & Molecular Biology), Jefferson Plegaria (Biochemistry & Molecular Biology)

Bacterial microcompartments (BMCs) are proteinaceous organelles predicted to be present across 23 different bacteria phyla, highlighting their prevalence in metabolic pathways. They consist of a protein shell that encapsulates densely packed enzymes and ancillary proteins. Compartmentalization of interconnected reactions by the BMC shell allows for increasing local substrate concentration, which enhances the catalytic activity of encapsulated enzymes. BMCs also provide a barrier preventing potentially toxic and volatile intermediates from diffusing into the cytoplasm. Given these features, BMCs provide a promising template for engineering subcellular bioreactors that can be designed for custom metabolic functions. Our lab is working towards encapsulating an electron transfer (ET) protein within a synthetic BMC shell. This work will provide a foundation to design ET pathways and ET-coupled catalytic reactions in BMCs, thereby potentially expanding their use in biotechnological applications. My goal is to heterologously express and characterize flavodoxin (FP1) pfam02241, which can transfer two electrons, that has been modified with a peptide to direct encapsulation. I plan to test the expression yield and solubility with and without the added peptide. Moreover, I aim to isolate FP1 using biochemical purification methods and to study its absorption properties using ultraviolet-visible spectroscopy. Ultimately, the results from my characterization will be important in our efforts to encapsulate FP1 inside synthetic shells.

COBALT, NICKEL, AND CADMIUM TOLERANCE IN MESORHIZOBIA ADAPTED TO SERPENTINE SOILS AND GENE KNOCKOUT OF CANDIDATE RESISTANCE GENES
Ellen Garcia (Florida International University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 48
Mentor(s): Maren Friesen (Plant Biology)

Heavy metals can be hazardous to our health and can easily enter our water systems and contaminate soil and aquatic ecosystems. Bioremediation is an important tool in this area that uses organisms to transform heavy metals into nontoxic forms or sequester it. Rhizobia are gram-negative bacteria that have a symbiotic relationship with legumes such as chickpeas and lentils and are potentially useful for bioremediation of heavy metals in soil. Knowing the molecular basis for this and the genes responsible for tolerance to heavy metals could allow for advances in biotechnology for bioremediation purposes. Candidate genes have been identified for a Nickel-Cobalt-Cadmium resistance protein found in rhizobia. A gene knock out is a technique used to find out what the function of a gene is by making the gene inoperative. The type of gene knock out technique that will be used on this resistance protein is an in-frame deletion, which requires specific primers to recombine the gene followed by inserting it into a suicide vector via transformation. Triparental mating will allow a transfer of the plasmid into the rhizobia. A growth assay will be done to confirm if the gene is responsible for heavy metal tolerance. Strain fitness will be compared with the gene of interest versus with the gene knocked out in the presence of nickel, cobalt and cadmium separately. This will be done by measuring absorbance on a plate reader multiple times per day, which is highly correlated with cell density.

EFFECTS OF DETERGENT CONCENTRATION ON SPECIFIC ACTIVITY, FRACTIONATION PROFILES, AND PURITY USING OPTIMIZED GPDH ACTIVITY ASSAY
Karissa Gorr (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 49
Mentor(s): Denis Proshlyakov (Chemistry)

There is currently no cure for metabolic diseases such as Alzheimer's and Type 2 diabetes that result from mitochondrial dysfunction. This is compounded by the difficulties in studying intact mitochondria at the level of individual enzymes. One of these enzymes of interest, mitochondrial glycerol 3-phosphate dehydrogenase (mGPDH), catalyzes a reversible oxidation of glycerol-3- phosphate (G3P) with the formation of dihydroxyacetone phosphate. In addition to its physiological role, G3P shuttle may allow to exchange electrons with the intact respiratory chain to study its function. This study is aimed at developing a fast and high-throughput method of purifying mGPDH. This requires, in part, carrying out rapid and specific activity measurements on protein samples. Starting with published protocols for mGPDH assay, we greatly improved its reproducibility and sensitivity by controlling light exposure and incorporated an additional product solubilization/extraction step. As G3P is enzymatically oxidized in this assay, menadione mediates electron transfer to iodonitrotetrazolium chloride (INT), which, in turn, is reduced to formazan with distinctive optical absorption around 500 nm. Poor solubility of formazan in water was offset by either extraction in hexanol (A_{max}=490 nm) or addition of acidic SDS (A_{max}=504 nm) after the assay. Optimized assay was combined with automated measurements in 96-well microplate reader to develop ammonium sulfate fractionation of mGPDH. We examined several concentrations of Brij-35 and cholate as detergents for initial solubilization, and their effects on specific activity, fractionation profiles, and purity. These methods can also be applied for further chromatographic purification.

CO-REGULATION OF FLAVONOID AND TERPENOID BIOSYNTHESIS IN GLANDULAR TRICHOMES OF TOMATO
Nicole Haddad (Purdue University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 50
Mentor(s): Gregg Howe (Plant Biology), Brian St Aubin (Plant Biology), Koichi Sugimoto (Plant Biology)

The type VI glandular trichomes of cultivated tomato produce large quantities of secondary metabolites that are implicated in chemical defense against arthropod herbivores. Terpenoids and flavonoids appear to be the dominant classes of secondary compounds in glandular trichomes of tomato and many other plant species as well. Although previously considered to be independent metabolic pathways, new data suggest that terpenoid and flavonoid pathways in glandular trichome cells are co-regulated. To test this hypothesis, we measured the terpenoid and flavonoid levels in trichome glands from various genotypes of tomato, as well as plants grown under different light intensities. This data was gathered by leaf dip extractions and analysis of extracts by Gas Chromatography Mass Spectrometry and Light Chromatography-Mass Spectrometry. The data was analyzed in R. The results revealed a strong positive correlation in the levels of major end products of both the terpenid and flavonoid pathways. A particularly strong correlation was observed between light intensity and levels of β-phellandrene (an abundant monoterpenoid) and glycosylated derivatives of the flavonol quercitin. These findings suggest that a flavonoid-related metabolite may be involved in transcriptional control of terpenoid production.

REGULATION OF KUPFFER CELLS BY HEPATIC STELLATE CELLS
Jordan Hood (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 51
Mentor(s): Bryan Copple (Pharmocology & Toxicology), Elahe Crockett (Medicine)

It is known that activation of Hifl-alpha in hepatic stellate cells (HSC) is required for macrophage activation. Additionally we know that necrotic cells do not directly cause macrophage activation. However, conditioned medium from HSCs treated with necrotic hepatocytes did activate macrophages. We are examining the cross communication of HSC and macrophages in order to identify the mediator that is released by HSC that regulations macrophage activation. Methods/Results: First LX2 cells, a human HSC cell line, were cultured in DMEM medium and treated with necrotic cells for 1- and 4- hours. Protein was collected from these cells and analyzed by western blot to look for activation of cyclooxygenase-2 (COX2) protein levels. COX2 protein appeared to be induced in necrotic cell treated- and untreated -LX2 cells. To investigate if COX2 was being activated at an earlier time point, LX2 cells were treated 15-, 30-, and 60- minutes and mRNA was also collected from these cells to be analyzed by real-time PCR. In addition, we collected primary cells, bone marrow macrophages, from wild type mice and treated them with two eicosanoids that have been shown to be upregulated in HSC's: prostaglandin -E2 and 12-HETE. mRNA will be isolated and analyzed for upregulation of proinflammatory and phagocytosis-related genes. Conclusion: We believe that HSCs release an arachidonic-acid derived eicosanoid mediator that can modulate macrophage phenotype. Further identification of the mediator responsible for the up-regulation of macrophages could potentially lead to better treatment for liver damage that leads to chronic diseases such as fibrosis. Support: J.H. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

TGF-β1 DOWNREGULATES ACE-2 IN HUMAN LUNG FIBROBLASTS
Courtney Jackson (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 4, 1:00 PM - 2:15 PM
Poster: 52
Mentor(s): Elahe Crockett (Medicine), Bruce Uhal (Physiology)

Angiotensin II is recognized as a proapoptic and profibrotic factor and is known to mediate fibrosis in many of the bodies organs. Earlier work has demonstrated that Angiotensin II (ANGII) is degraded by the angiotensin converting enzyme-2 (ACE-2). This is accomplished by converting ANGII to angiotensin 1-7 (ANG1-7). Additionally, it has been demonstrated that ANGII mediates lung fibrosis and that ACE-2 protects against lung fibrosis by limiting the local accumulation of ANGII, the profibrotic peptide. ANGII has been shown to up-regulate transforming growth factor (TGF)-β1 and collagen synthesis in normal human lung fibroblasts. However, ACE-2 is down-regulated in human and experimental lung fibrosis. The up-regulation of TGF-B1 by ANGII will cause a decrease in the protective enzyme ACE-2 in human lung fibroblasts. To determine if TGF-β1 causes the down-regulation of cellular ACE-2, 70-80% confluent IMR90 cells will undergo serum starvation for 20 hours, and then will be

treated with 2ng/ml TGF-β1. Western blots will be performed on cell lysates and media. Reverse-transcription polymerase chain reactions (RT-PCR) will be used to quantify mRNA in the presence and absence of TGF-β. We have successfully cultured, and performed parts of the experiments, and the results and analysis of the data are currently in progress, which will be discussed during the conference presentation. The findings of this study will assist in the development of therapeutics for patients suffering from pulmonary fibrosis. C.J. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

INVESTIGATION OF THE MOLECULAR MECHANISMS BY WHICH RBF1 REGULATES GENE EXPRESSIONS IN DROSOPHILA MELANOGASTER
Gejae Jeffers (University of the Virgin Islands)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 54
Mentor(s): Rima Mouawad (Biochemistry & Molecular Biology), David Arnosti (Biochemistry & Molecular Biology)

The Retinoblastoma (RB) protein is a tumor suppressor that regulates major cellular processes such as proliferation, differentiation and apoptosis. The RB regulates cell cycle progression by binding to E2F/DP and inhibiting their activity. The deregulation of Rb/E2F pathway is present in many human cancers. Many studies have focused on Rb role in cell cycle control, but less is known about its function in other processes. Using the Drosophila system, our aim is to understand the molecular mechanisms by which Rb regulates target genes. Overexpression of different RBF1 (fly Rb homolog) isoforms in wing discs resulted in differential gene expression as measured by RNA-seq. I am carrying out bioinformatics analysis to study the genes that are regulated differently by RBF1. The amount of read counts and the fold change obtained was clustered based on gene expression across the average experimental status. To validate the enrichment of RBF1 on the target genes, the clustered genes were identified and subjected to annotative functionality to function analysis using DAVID annotation tool. We proposed that a detail summary of specific genes involve in apoptosis within the Drosophila. As such, we will be able to understand the impact of RBF1 and RBF1 mutations on different classes of genes

COMPARATIVE BIOCHEMICAL GENOMICS OF RESIN GLYCOSIDE BIOSYNTHESIS IN CONVOLVULACEAE
Nicholas Karavolias (Cornell University)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 55
Mentor(s): Gaurav Moghe (Biochemsitry)

There is a vast diversity of plant specialized metabolites that have significance in agriculture, medicine, industrial manufacturing and other applications. One class of agriculturally important specialized metabolites is resin glycosides, which are allelopathic, weed growth-inhibiting compounds produced in the roots of some species in the Convolvulaceae (morning glory) family. Resin glycosides are sugar esters composed of di,tri,tetra or penta saccharides esterified to different acyl chains. This project seeks to increase understanding of resin glycoside diversity and biosynthesis for application in crop improvement and agriculture using comparative biochemical genomics. Towards this goal, we sampled 13 species in the Convolvulaceae family to understand their root metabolite profiles and phylogenetic relationships. Mass spectrometric analysis of root extracts revealed that Ipomoea tricolor produces over a dozen resin glycosides, with some of them present within 4 weeks of development. We also analyzed sequences of three genes – matK, ndhF and trnL-F – from multiple Convolvulaceae species to understand the evolutionary relationships between those species, resolving them from Solanaceae species. We are currently analyzing the mass spectrometric profiles of selected species at additional developmental stages and growth conditions for resin glycoside production. In addition, we are conducting functional bioassays to determine the effects of resin gylcosides on growth of other plants. Finally, we are conducting bioinformatic analyses to characterize candidate genes involved in resin glycoside biosynthesis. This project will not only increase the understanding of resin glycoside diversity and enzymatic control in Convolvulaceae but also help provide sustainable solutions for weed control in agricultural settings.

MICROSCOPIC STUDY ON CELL WALL COMPONENTS IN ZIP-LIGNIN POPLARS ALTERED BY CUAHP PRETREATMENT
Amelia Keyser-Gibson (Haverford College)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 56
Mentor(s): Shiyou Ding (Plant Biology), Muyang Li (Plant Biology)

The GLBRC has developed “Zip-lignin” poplar mutants with the incorporation of ferulates in lignins, resulting in easier break down by alkaline pretreatments that allow for the cell walls to be more accessible. This is a crucial discovery in the development of biofuels because the polysaccharides in the cell walls are mostly covered by lignin, but must be available to be converted into sugars by enzymes, and previously the degradation of lignin was long, cost intensive process. This project analyzes samples of “Zip-lignin” poplar lines pretreated with copper alkaline hydrogen peroxide (CuAHP) pretreatment, which oxidizes and solubilizes lignins to improve the cell wall accessibility. We hope to determine which cell wall components in the Zip-poplars become most accessible based on the different pretreatment chemistry. Florescence microscopy is being utilized to analyze carbohydrate-binding modules (CBMs) tagged with fluorescence protein (GFP or RFP), as well as antibodies with affinities to different cell wall components. The effects of the pretreatment can be quantified by analyzing the binding of CBMs and antibodies to specific cell wall structures. In order to establish the effect of pretreatment on the cell wall structure, the intensity of the binding can be compared quantitatively by fluorescence microscopy between samples before and after pretreatment, as well as the different mutant lines. This work aims to find the changes of poplars after “Zip-lignin” incorporation and current leading poplar or woody biomass pretreatment to understand the feasibility for using the new “Zip-lignin” poplars as a feedstock in the biofuel industry.

TESTING THE ROLE OF PEROXIREDOXIN Q IN THE SYNTHESIS OF 16:1△3T FATTY ACID
Jonathan Kizer (Pennsylvania State University)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 57
Mentor(s): Patrick Horn (Plant Research Laboratory Nat Science)

Chloroplast membranes are composed of a specialized glycerolipid matrix essential for plant growth and development. Phosphatidylglycerol, one of four major classes of polar lipids in this matrix, is enriched in an intriguing fatty acid 16:1△3t found in almost all plants though its function is unclear. This fatty acid is synthesized in the chloroplast by the enzyme Fatty Acid Desaturase 4 (FAD4) and has a trans double bond configuration as opposed the cis configuration found in most plant unsaturated fatty acids. Using the model plant Arabidopsis thaliana, we found that a T-DNA insertion mutant (prxq) in another chloroplast-localized protein Peroxiredoxin Q showed a more than 75% reduction in the amount of 16:1△3t fatty acid using thin layer and gas chromatography. This suggested that peroxiredoxin Q might be involved the synthesis of 16:1△3t possibly as a redox cofactor of FAD4. We are using multiple approaches to test if PRXQ physically interact including bimolecular fluorescence complementation by transient expression in tobacco leaves and coimmunoprecipitation within bacteria and yeast heterologous systems. Further characterizing this putative cofactor will further the understanding of the biosynthesis of 16:1△3t and possibly lead to additional insight into its function in plants.

TRICLOSAN RESISTANCE IN BACTERIAL POPULATIONS FROM THE RED CEDAR
Thomas Lemke (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 58
Mentor(s): Terence Marsh (Microbiology & Molecular Genetics)

Triclosan, also known as irgasan, is a broad-spectrum antibiotic that is commonly used in household products. Although the FDA has approved its use due to triclosan's bacteriostatic and bacteriocidal properties, there is considerable controversy on whether or not it is effective and what the environmental consequences are. Triclosan is an additive to handsoaps and cosmetics and the net result of its broad usage is contamination of the environment, including freshwater systems. A number of bacterial strains are known to have resistance to triclosan and clearly over use of the product could result in increases in resistance to triclosan amongst environmental strains of bacteria. To determine the extent of triclosan resistance in freshwater bacteria we isolated approximately 1000 triclosan resistant strains and characterized them phylogenetically. A total of 861 strains resistant to irgasan were isolated from the red cedar. 206 were identified to the geneus level and 204 to the species level using comparative 16S rRNA sequencing. The top 4 genera accounting for 94.8% of the total strains identified to genus level included Pseudomonas (79.1%), uncultured bacterium (5.83%), Rahnella (2.91%), and Aeromonas (1.94%). The top 4 species accounting for 94.1% of the total were Pseudomonas taiwanensis (90.2%), Pseudomonas marginalis (1.96%), Pseudomonas libanensis (.98%), and Erwinia aphidicola (.98%). Erwinia rhapontici and Pseudomonas meridian were also identified, which have not been previously described to have triclosan resistant properties. These results will allow us to identify potential mechanisms for triclosan resistance as well as categorize antibiotic resistance patterns of freshwater bacteria.

ELECTROCHEMISTRY OF HIGHLY OXIDIZED SPECIES IN METALLOENZYMES
Grant LeVasseur (Michigan State University), Priyansh Sharma (Westview High School)
Category & Time: Biochemistry and Molecular Biology, Section 5, 1:00 PM - 2:15 PM
Poster: 59
Mentor(s): Denis A Proshlyakov (Chemistry)

Metalloenzymes play key role in a variety of life functions. For many redox-active enzymes the key catalytic step requires a highly oxidized metal complex at their active site. To understand structure and function of such species, they must be trapped and isolated; this is difficult because they are very reactive and exist only briefly. We have developed a method to study highly oxidized species of such metal centers in different enzymes using our novel spectroelectrochemical technique. Our approach utilizes a 3D printed electrochemical cell that replaces a standard 1-cm optical cuvette for use with any spectrophotometer. The unique feature of this "thick layer" method is that it allows study of many more enzymes than a traditional "thin layer" approach and it allows manipulation of the sample mid-experiment. We have targeted two high-impact enzymes with intriguing properties of their highly oxidized species. First is Cytochrome c Oxidase from beef mitochondria, which has clear signatures of two oxidized intermediates P and F, with yet unknown mechanism of proton pumping upon their interconversion. Second is bacterial enzyme TauD with a similar transient species, except that this species has never been detected outside its rapid reaction cycle. Establishing its redox and spectral properties is critical to understanding reaction of this and many related enzymes. Control studies may also include well-characterized enzyme horseradish peroxidase which contains a heme iron metal center similar to that found in Cytochrome c Oxidase.

PHYSCOMITRELLA AND MORTIERELLA: A POTENTIALLY EFFECTIVE DITERPENE-PRODUCING TEAM
Emily Lockwood (University of Florida)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 61
Mentor(s): Bjoern Hamberger (Biochemistry & Molecular Biology), Britta Hamberger (Biochemistry & Molecular Biology)

Diterpenes, a class of hydrocarbons characterized by a 20-carbon backbone with a hydrophobic nature, are useful for a wide variety of applications. They are used as flavorings and fragrances and have medicinally important antimicrobial, antifungal, and analgesic properties. Current production of diterpenes relies on expensive chemical synthesis or extraction from the native source. Biotechnological production offers a more sustainable alternative. Combining the easily transformable basic land plant Physcomitrella with the endophytic fungus Mortierella could potentially create an effective biosynthetic factory for production and extraction of high-value diterpenes. Physcomitrella is a bryophyte that is ideal for genetic engineering due to its fully sequenced genome and its capacity for homologous recombination. Additionally, Mortierella is a fungus that is known to interact with many other species to form symbiotic relationships; it also has naturally occurring lipid bodies which will be useful in accumulating the hydrophobic diterpenes. By inoculating Physcomitrella with Mortierella and observing the interaction using

microscopy, we can test if Physcomitrella and Mortierella develop an endophytic relationship. Then, by transforming either or both to express a metabolic pathway for diterpenes, a novel symbiotic production platform will be explored.

IDENTIFICATION OF MONOLIGNOL TRANSPORTER IN LIGNIN BIOSYNTHESIS
Natalia Madrigal Martinez (University of Michigan)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 62
Mentor(s): Federika Brandizzi (Great Lakes Bioenergy Research Center), Sang-Jin Kim (Great Lakes Bioenergy Research Center), Starla Zemelis-Durfee (Great Lakes Bioenergy Research Center)

Manipulating the biofuel feedstock to increase the efficiency of bioethanol production is important to increasing the yield of biofuel. One of main problems in the plant feedstock processing is the lignin in the plant cell wall that hampers the extractability of fermentable sugars. Lignin is a complex organic compound that is crucial for maintaining the structural integrity of plants. Lignin is created through the oxidative coupling of the three most abundant monolignols: p-coumaryl alcohol, coniferyl alcohol, and sinapyl alcohol, that are transported from the cytosol though an unknown mechanism [1]. Previously AtABCG29, an ATP-binding cassette transporter, transporter, was identified as a p-coumaryl alcohol transporter in Arabidopsis [2]. However, the transport of other monolignols to apoplast has not been identified yet. To identity monolignol transporters we have selected candidates using the gene expression profile of flax in two different types of tissue and three developmental stages to select putative transporters enriched in the tissue containing high level of lignin. We then screened the possible null mutants bearing T-DNA in the loci of our candidate genes in Arabidopsis. To confirm the genetic background of the mutants, a reverse transcription polymerase chain reaction method was adapted in order to determine whether the mutants are completely knockout or knockdown mutants. The confirmed mutants were then grown in a media containing monolignols to monitor their sensitivity. By understanding the biological process in which way monolignols are transported, we can better engineer lignin in order to have more efficient and beneficial plants for bioenergy.

THE ROLE OF PKM2 IN TCDD-ELICITED HEPATOTOXICITY IN MICE
Gena Markous (University of Waterloo)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 63
Mentor(s): Timothy Zacharewski (Biochemistry & Molecular Biology)

The environmental contaminant 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) elicits dose-dependent hepatic lipid accumulation primarily through activation of the aryl hydrocarbon receptor (AhR) that may progress to steatosis with inflammation and fibrosis. We have previously demonstrated that TCDD exposure in mice results in the reprogramming of hepatic metabolism, characterized by pyruvate kinase isoform switching from the M1 isoform (*Pkm1*) to the M2 isoform (*Pkm2*), via an AhR-dependent mechanism. Consequently, we hypothesized that *Pkm2* which sits at the intersection of cell proliferation and anti-oxidant defenses plays an important role in protecting hepatocytes from TCDD-induced toxicity. To test the hypothesis, male $Pkm2^{fl/fl}$ mice were intraperitoneally injected with an adeno-associated virus serotype 8 (AAV8) carrying either Cre recombinase or GFP (control) genes to generate a hepatocyte specific Pkm2 knock-out model (LKO). After four days treatment with AAV8, male *Pkm2* inducible knock-out mice ($Pkm2^{fl/fl}$) mice were orally gavaged with sesame oil vehicle or 30 μg/kg TCDD every 4 days for 28 days. Consistent with previous reports, TCDD increased relative liver weight, although the increase in LKO mice was greater compared to GFP mice supporting a protective role for *Pkm2*. Similarly, TCDD treated LKO mice exhibited reduced body weight gain. Gene expression, protein level determinations, and histological evaluations will be presented demonstrating the role of *Pkm2* as a novel defense mechanism against TCDD-induced hepatotoxicity.

ROLE OF ENDOCYTOSIS IN SIRNA THERAPEUTIC DELIVERY
Calla Martysz (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 64
Mentor(s): Daniel Vocelle (Chemical Engineering), S Patrick Walton (Chemical Engineering)

Modern medicine is limited in its treatment of disease-associated proteins. One potential solution is short interfering RNA (siRNA) therapeutics, in which nucleic acids target a protein's precursor, causing sequence-specific degradation. To date, siRNA therapeutics have been developed for cancers, genetic disorders, and infectious diseases. The implementation of siRNA therapeutics is hindered by delivery vehicles which are inefficient at transporting siRNA. Among the many endocytotic pathways used to transport cargo into a cell, there is no consensus regarding the correct pathway for siRNA delivery. Using pharmaceutical inhibitors targeting each of the various types of endocytosis (Clathrin-, Caveolin-, GRAF1-, ARF6-, and Flotillin-mediated), our work investigates the preferred pathway for siRNA delivery. Using silica nanoparticles of various size, charge, and surface functionalization, we can also determine the optimal delivery vehicle characteristics for uptake through a specific endocytotic pathway. To date, our research has shown that optimal silencing occurs via an Arf6-dependent pathway, and that a delivery vehicle's uptake by this pathway is influenced by surface functionalized dextran and amines.

TRANSFORMATION OF EUPHORBIA LATHYRIS FROM A NUISANCE TO A BIOFUEL
Davis Mathieu (South Dakota School of Mines Technology)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 65
Mentor(s): Bjrn Hamberger (Molecular Plant Biology)

Often deemed a weed in Europe and Asia, Gopher Sage (Euphorbia lathyris) shows great potential in the production of biodiesel. The plant has many advantageous traits keying it as a competitive resource in the biofuel industry, namely production of useful compounds called terpenoids, a relatively short growth cycle, and an ability to grow in limited conditions. E. lathyris suffers one major drawback however. Wild type E. lathyris produces strong toxins (phorbols) making the plant unsuitable for large scale biodiesel manufacturing. We believe utilization of CRISPR/Cas9 technology would allow for targeted gene silencing. Elimination of the entry step, initiated by casbene synthase, would disrupt the formation of the phorbol pathway entirely. Our engineered CRISPR/Cas9 system will cause a double stranded break in the casbene synthase open reading

frame (ORF). Repair pathways for double stranded breaks often lead to InDel and frameshift mutations to the ORF, potentially leading to complete loss of gene function. Utilizing Agrobacterium as a transducing element, E. lathyris is transformed, positive transformants are then isolated, and screened for a lack of toxic properties. Successful gene knockout and disruption of the phorbol pathway would establish Euphorbia lathyris as a promising crop in the biofuel industry.

UTILIZATION OF A SITE-DIRECTED MUTAGENESIS APPROACH TO UNDERSTAND THE SELF-ASSEMBLAGE OF A BACTERIAL MICROCOMPARTMENT SHELL PROTEIN
Sean McGuire (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 6, 2:30 PM - 3:45 PM
Poster: 66
Mentor(s): Clement Aussignargues (Plant Research Laboratories), Cheryl Kerfeld (Plant Research Laboratories)

Bacterial microcompartments (BMCs) are self-assembling organelles found within many bacterial phyla. They are composed of a selectively permeable protein shell encapsulating enzymes and other proteins that constitute a metabolic pathway. They are essential in anabolic (CO₂ fixation) or catabolic (carbon compound degradation) processes within the bacterium. The proteinaceous shell is composed of hexamers (BMC-H) and trimers (BMC-T, tandem-domain) which exhibit a similar fold, and pentamers (BMC-P) capping the vertices. Some of these shell proteins are able to self-assemble into higher-order structures. We utilize a synthetic BMC shell system (HO shell) as a model to unveil the structural determinants of this self-assembly process: these shells are composed of seven proteins, one BMC-H, three BMC-T and three BMC-P proteins. When recombinantly expressed in Escherichia coli, BMC-H self-assembles into “swiss-rolls”, which, once purified, roll out into flat sheets. BMC-T1, in contrast, is completely soluble. By comparing the sequences and structures of the two proteins, we identified motifs potentially involved in the formation of protein architectures. To test our hypothesis, we designed a set of mutations that we inserted into BMC-H by using a site-directed mutagenesis method. A combination of in vivo (thin section transmission electron microscopy) and in vitro (solubility assays) approaches showed that point-mutations at key residues of BMC-H can lead to the formation of different architectures, or even abolish the ability to self-assemble. These engineered building blocks are ideal candidates as novel biological scaffolding frameworks and nanomaterials for potential use in biotechnology.

MEHG-INDUCED CYTOTOXICITY THROUGH VESICULAR RELEASE OF GLUTAMATE IN MOUSE PRIMARY CEREBELLAR AND CORTICAL ASTROCYTES
Paige McKeon (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 69
Mentor(s): William Atchison (Pharmacology & Toxicology), Rosa Jaiman (Pharmacology & Toxicology)

Methylmercury (MeHg) produces excitotoxicity in neurons by enhancing their release of glutamate. Astrocytes protect the neurons by removing glutamate from the extracellular space. Studies have shown that MeHg also affects astrocytes by causing them to release glutamate, which further increases neuron excitotoxicity. The objective of this study was to determine if MeHg could produce cytotoxicity through vesicular release of glutamate in cerebellar and cortical astrocytes. Primary astrocyte cultures of 7-8 days old mice were exposed for 3h to 0, 1, 2, or 5μM MeHg. Cytotoxicity was measured 24h after exposure using ethidium homodimer and calcein-AM. To determine if astrocyte death was due to a vesicular release of glutamate, Rose Bengal (RB) was added to inhibit glutamate uptake into vesicular lumen. The mean percentage of cell death in the MeHg + RB group of cerebellar astrocytes was: 0.6%, 2%, 9%, and 30% at 0, 1, 2, or 5μM MeHg, respectively. In the MeHg + RB group of cortical astrocytes, it was: 2%, 5%, 14%, and 29%, respectively. Compared to the MeHg exposure group, there was a significant reduction in cell death of 61% and 67% at 2 and 5μM MeHg in cerebellar astrocytes treated with MeHg + RB. In the MeHg + RB group of cortical astrocytes, there was a significant decrease in cell death of 37% at 5μM MeHg in comparison to the MeHg exposure group. This suggests that the vesicular release of glutamate from astrocytes due to MeHg toxicity contributes to cerebellar and cortical astrocytic death.

SALICYLIC ACID INHIBITS OXIDATIVE PHOSPHORYLATION IN GUINEA PIG CARDIAC MITOCHONDRIA
Mackinzie Miller (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 70
Mentor(s): Jason Basil (Physiology)

Salicylic acid (SA), at moderate to high doses, impairs the ability of mitochondria to generate ATP. SA is the active metabolite of aspirin, a nonsteroidal anti-inflammatory drug. Aspirin is used to treat a wide variety of symptoms and sometimes is used to help prevent heart attacks, however, only patients with cardiovascular disease show any net benefit when taking the drug. Here, we show that SA impairs cardiac mitochondrial function by uncoupling ATP production from oxidative metabolism and impairing the ability of mitochondria to take up and oxidize fuel. Cardiac mitochondria from guinea pigs were energized with glutamate and incubated with SA ranging from 0 to 5 mM. This range of concentrations is based off of the total plasma SA levels found in humans when taking aspirin for analgesia (0.5 mM), rheumatoid arthritis therapy (1.5 – 2.5 mM), or exposed to toxic levels (3 - 10 mM). Oxygen consumption and membrane potential were measured simultaneously using an Oroboros O2k equipped with a fluorescence module. As the SA concentration increases, mitochondrial respiration increases, membrane potential decreases, and the rate of ATP production is severely reduced. In addition, the time to reach the maximum rate of oxidative phosphorylation increased as the SA concentration increased. In conclusion, SA not only uncouples mitochondria, but also interferes with their ability to oxidize fuel. Future work will identify what component of oxidative phosphorylation (substrate transport and oxidation, electron transport, or ATP production) is affected by SA.

ENVIRONMENTAL FACTORS INFLUENCING BIOFILM FORMATION BY FISH PATHOGENS
Mariane Mota Cavalcante (Universidade Federal de So Carlos- Sorobaca)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 71
Mentor(s): Terence Marsh (Microbiology & Molecular Genetics)

Wild populations of many fish species are threatened or endangered due to a variety of factors including over fishing and habitat loss or degradation. Frequently habitat degradation includes environmental shifts that lead to increased predation of eggs by microbial populations. Eggs newly released from the female are free of bacteria but quickly become colonized by aquatic bacterial populations that form biofilms on surfaces of eggs. This project investigates the stimuli for biofilm formation in fish pathogens of Lake sturgeon (Acipenser fulvescens) eggs. Lake sturgeon is an endangered species that has a very low rate of successful reproduction due to several factors including high egg mortality. We tested a collection of strains isolated from sturgeon eggs or known fish pathogens for biofilm formation under different environmental conditions. Biofilm formation of Pseudomonas sp, Brevundimonas sp, Hydrogenophaga sp, Acidovorax sp. Aeromonas sp. and Flavobacterium columnare were tested at different concentrations of protein and metals in order to assess what influence these factors have on the biofilm formation. Our results might help to establish better management practices in the lake sturgeon conservation that will lead to increases in the reproductive success of the species. The results may be more broadly applied to aquaculture practices as well.

AN ILBP FAMILY MEMBER DOMAIN SWAPPED DIMER IS EVIDENCE FOR A HIGHLY ORDERED FOLDING INTERMEDIATE
Anika Nwosuocha (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 72
Mentor(s): Zahra Assar (Chemistry)

Human Cellular Retinol Binding Protein II (hCRBP II), a member of the intracellular Lipid binding protein (iLBP) family, is a monomeric protein responsible for the intracellular transport of retinol and retinal (1)(2). HCRBPII and other members of this family have been shown to be remarkably stable to mutations. Previous studies on other proteins of this family have shown that they fold into monomeric species (3). However we report, for the first time, that wild-type (WT) hCRBPII gives rise to an extensive domain swapped dimer (involving almost 50% of the protein sequence) during bacterial expression. In addition, there is no evidence of interconversion between monomer and dimer at room temperature, even after weeks of incubation, suggesting that two non-interconverting folds can result from the same amino acid sequence. Though wild-type hCRBPII forms the dimer, the propensity for dimerization can be substantially increased via mutation at Tyr60. Structural studies of wild-type and several mutant dimers suggest that an “open monomer” folding intermediate gives rise to both monomer and dimer, and their ratio depends on the relative orientation of the two halves of the protein in the open monomer intermediate. Therefore, Nature may build in an interaction (a Tyr60-Glu72 hydrogen bond) in a folding intermediate to prevent dimerization to yield the physiologically relevant monomeric protein, begging the question of whether other members of the iLBP family form physiologically relevant dimer species.

EFFECTS OF METHYLMERCURY EXPOSURE IN MOTOR NEURON NSC34 SOD1-G93A TRANSFECTED CELLS
Doris Olekanma (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 73
Mentor(s): Alexandra Colon Rodriguez (Pharmacology & Toxicology)

Methylmercury (MeHg), a persistent environmental neurotoxicant, has been considered a possible contributor to the development of Amyotrophic Lateral Sclerosis (ALS), a devastating neurological disease. Our lab demonstrated that MeHg exposure in an ALS mouse model (SOD1-G93A) accelerated the onset of the disease measured as motor dysfunction. Alterations in $[Ca^{2+}]_i$ in motor neurons mediated in part by Ca^{2+} permeable AMPARs were also observed. In order to identify if MeHg is contributing to an accelerated cell death in the SOD1-G93A motor neurons we used an in vitro approach. Using the motor neuron cell line NSC34-SOD1G93A transfected cells, we hypothesize that modifications in Ca^{2+} permeability and expression of AMPARs, resulting from exposure to MeHg, will occur. In this study we performed a sequence of experiments, including: RNA isolation, QPCR for AMPAR GluA1-4 subunit expression and RNA editing efficiency measurements using restriction digestion enzymes. An alteration in the expression of the AMPAR’s as well as the alteration in the editing of GluA2 subunit in the NSC34-SOD1G93A cell line exposed to MeHg is expected. Highlighted in previous studies, the presence of edited GluA2 is a key determinant of Ca^{2+} permeability of AMPARs. With a decreased RNA editing efficiency and expression of unedited GluA2 (R), Ca^{2+} permeability of AMPARs surges, resulting in increased $[Ca^{2+}]_i$, which in turn mediates a mechanism for neuronal death. We believe that AMPAR’s are contributing to MeHg-induced increases in $[Ca^{2+}]_i$ by increasing their expression and permeability to Ca^{2+} through a mechanism involving decreased RNA editing efficiency.

THE EFFECTS OF MINERALOCORTICOID RECEPTOR ANTAGONISM IN TRPV4 MEDIATED VASODILATION IN THE AORTA OF HYPERTENSIVE RATS
Darren Peel (Kalamazoo College)
Category & Time: Biochemistry and Molecular Biology, Section 7, 2:30 PM - 3:45 PM
Poster: 74
Mentor(s): Anne Dorrance (Pharmacology & Toxicology)

Understanding the vascular action of transient receptor potential (TRP) vanilliod 4 (TRPV4) channels is imperative to the development of novel and effective therapeutic treatments for hypertension. TRP channels are potential therapeutic targets due to their role in vascular tone. The activation of TRPV4 channels in particular have been shown to result in vasodilation. Additional areas of research have elucidated the effects of mineralocorticoid receptors (MR) in hypertension. However the mechanism of MR activation and its relation to TRPV4 are still unknown. A major area of research is focused on a category known as MR antagonists, known to be anti-hypertensive agents. Canrenoic acid is a MR antagonist that is currently being researched for its role in vascular tone. We hypothesize that canrenoic acid will prevent the impairment of TRPV4 mediated dilation in the aorta of hypertensive rats. To test our hypothesis, we will treat six-week-old male SHRSP with canrenoic acid or a control vehicle (water) for six weeks. Following treatment, aortic vasodilation will be assessed using wire myography in the presence of TRPV4 agonist (GSK1016790A) or TRPV4 antagonist (HC067047). Next, mRNA and protein expression of TRPV4 will be assessed. Our expected

results will show an increase in TRPV4 mediated vasodilation and an up-regulation of TRPV4 mRNA and protein in the canrenoic acid treated group. Expression of TRPV4 in smooth muscle and endothelial cells of the cardiovascular system along with its role in vascular tone make it a novel pharmacotherapeutic target for treatment of hypertension.

THE STEREOCHEMISTRY OF BIOSYNTHETICALLY PRODUCED PHENYLSERINE
Shahrazad Polk (Texas Southern University)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 76
Mentor(s): Kevin Walker (Chemistry)

Phenylserine is classified a β-hydroxy-α-amino acid. These are the building blocks of many important medicines, such as Taxol, L-DOPS, and Vancomycin. There are four possible structures of phenylserine; L-erythro-phenylserine, D-erythro-phenylserine, L-threo-phenylserine, and D-threo-phenylserine. Carrying out the biosyenthetic synthesis of phenylserine could yield any of these isomers, so identifying the product's stereochemistry is pertinent. Only the L conformation exists biologically, and most medicines mimic biological compounds. In order to identify an isomer of phenylserine, we treat the biosynthetic mixture with L-threonine aldolase to cleave benzaldehyde and glycine. The benzaldehyde is extracted with ethyl acetate, and is combined with phenylhydrazine to form phenylhydrazone. From this we use GCMS to determine its peak height at 196 m/z. We hypothesize that L-threonine aldolase only reacts with L-phenylserines, and in a racemic mixture the peak is halved if the D isomer acts as an inhibitor to the L isomer.

PROTEIN-PROTEIN INTERACTIONS OF SULFUR METABOLIC ENZYMES AND SULFATE TRANSPORTERS IN PLANTS
Michael Rankin (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 77
Mentor(s): Anne-Sophie Bohrer (Biochemistry & Molecular Biology), Hideki Takahashi (Biochemistry & Molecular Biology)

Sulfate is an essential macronutrient for plant growth and development. Sulfate is taken up from the soil via plasma membrane-localized sulfate transporters, and is subsequently activated by ATP sulfurylase (ATPS) in plastids and cytosol to form adenosine 5'-phosphosulfate (APS). APS can then be either reduced in plastids by APS reductase to form primary metabolites such as cysteine and methionine, or phosphorylated in both cytosol and plastids by APS kinase (APK) to produce 3'-phosphoadenosine 5'-phosphosulfate (PAPS). PAPS biosynthesis in the plastids leads to elevate the concentration gradient of PAPS across the plastid envelope, allowing PAPS transporter to facilitate export of PAPS to the cytosol where PAPS serves as a sulfate donor for synthesis of sulfated secondary metabolites. In mammals, PAPS biosynthesis is catalyzed by PAPS synthase, a bifunctional enzyme containing ATPS and APK domains. Since orthologs for PAPS synthase are not found in plants, interaction between ATPS and APK may be postulated as a metabolic pathway control mechanism modulating PAPS biosynthesis. Moreover, it is reported that cytosolic OASTL-A1, an enzyme involved in cysteine biosynthesis, interacts with the C-terminal STAS domain of sulfate transporter to regulate its activity. Thus, it is hypothesized that protein-protein interactions between sulfur metabolic enzymes and sulfate transporters are key mechanisms controlling sulfate uptake and subcellular sulfur metabolic flux partitioning in plants. Protein-protein interactions between sulfate transporters, ATPS and APK are being studied using the model plant species Arabidopsis thaliana.

MEHG-INDUCED CYTOTOXICITY THROUGH CALCIUM CHANNELS IN PRIMARY CEREBELLAR ASTROCYTES
Nicole Rivera (Pontifical Catholic University at Ponce Puerto Rico)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 78
Mentor(s): Rosa Jaiman (Pharmacology & Toxicology)

Methylmercury (MeHg) is a potent pollutant that affects the nervous system, especially the granule cells in the cerebellum. This toxicant produces an increase in internal Ca2+ concentration ([Ca2+]i) through the influx of calcium (Ca2+) through the Ca2+ channels in neurons. Previous studies suggest that astrocytes are targeted before neurons. Similarly to neurons, changes in [Ca2+]i in astrocytes can occur by Ca2+ influx through Ca2+ channels. The effects of MeHg in the Ca2+ channels of astrocytes have never been studied. The aim of this project was to study the effect of MeHg in the Ca2+ channels, and its relationship with cerebellar astrocytes' cytotoxicity. Primary astrocyte cultures from the cerebellum of 7-8 day old C57BL/6 mice were exposed for 3h to 0, 1, 2, or 5μM MeHg. Cytotoxicity was measured 24h after the 3h of MeHg exposure using ethidium homo-dimer and calcein--AM. To determine if astrocyte death was due to an influx of Ca2+ through the Ca2+ channels, cadmium chloride was used to block all Ca2+ channels in the membrane. It was hypothesized that MeHg affects the Ca2+ channels in the membrane of cerebellar astrocytes producing cell death. Determining the relationship between MeHg-induced influx of Ca2+ with cell death could help us understand the mechanisms of MeHg toxicity in cerebellar astrocytes. Supported by NSF grant DBI1359302, and NIHgrants R01ES024064 and T32GM092715.

ISOLATION OF BIO ENERGY CROP PHYLLOSPHERE BACTERIA FROM SWITCHGRASS
Melissa Sleda (Lawrence Technological University)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 79
Mentor(s): Ashley Shade (Microbiology & Molecular Genetics)

The aerial surface of plants, known as the phyllosphere, represents the largest environmental surface area of microbial habitation on the planet, an estimated 10^8 km2 of surface globally. The phyllospheres of bioenergy crops are of particular interest for bioprospecting for efficient biomass degraders because of their adapted lifestyles to exploit leaf surfaces. The purpose of our experiment is to curate an isolate collection of bioenergy crop phyllosphere bacteria for genomic interrogation and future study of phyllosphere microbial interactions. In order to accomplish this we are using targeted plate-based cultivation conditions including several different types of media to target phyllosphere microbial growth. We will then taxonomically identify the isolates using Sanger sequencing of the 16s rRNA gene and compare them to the known diversity of phyllosphere communities. We hypothesize that the different cultivation techniques will yield phylogenetically unique strains of bacteria. That would mean that some microorganisms inhabiting the crop phyllosphere have specialized functions (and thus genetic pathways) that are beneficial to their leaf lifestyle and to their host. These differences could be tolerance to dessication, radiation, and nutrient limitations which are

important obstacles to overcome in the bioenergy crop production. Our expected outcomes are to have quantified the structure of intra-annual variability of switchgrass crop phyllosphere and soil microbial communities. This will help set the course for predicting and managing the dynamics of crop microbiota for the hosts benefit.

LARGE SCALE BIOCATALYSIS OF MEDICINALLY RELEVANT PHENYLSERINE ANALOGUES AND (2R,3S)-PHENYLISOSERINYL BACCATIN III
Brendyn Smith (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 81
Mentor(s): Kevin D Walker (Chemistry), Tyler Walter (Chemistry)

A 5-methylideneimidazol-4-one (MIO)-dependent phenylalanine aminomutase (*Tc*PAM) from *Taxus canadensis* plants lies on the biosynthetic pathway to paclitaxel (Taxol®), a potent anticancer and therapeutic agent. *Tc*PAM makes D-phenylalanine, which is later converted to phenylisoserine and attached as a side chain to a taxane core en route to paclitaxel. *Tc*PAM has been repurposed to catalyze an amination reaction with surrogate cinnamate epoxide substrates. An amino group donor, styrylalanine, is used with *Tc*PAM to produce analogues of phenylserine (β-hydroxy-α-amino acid), many of which are building blocks of medicinal molecules. A pilot study to explore scalability used *Tc*PAM (0.08% catalyst load), cinnamate epoxide (0.6 mmol), and *S*-styrylalanine (0.52 mmol) to produce *erythro*-phenylserine (~10 mg, 10.8% yield). The turnover number of *Tc*PAM for 3-bromocinnamate epoxide (k_{cat}=0.05 s^{-1}) was better than the turnover (k_{cat}=0.002 s^{-1}) of the unsubstituted cinnamate epoxide. The results from our initial study suggested that maintaining catalyst load at ~0.1% relative to substrate, yet increasing concentration of catalyst and epoxide substrate, should make upwards of 100-200 mg of 3-bromo-*erythro*-phenylserine. This product has immediate applications in aryl-aryl Suzuki coupling reactions. To scale-up the biocatalysis, heterologous enzyme production in *E. coli* was increased using Studier's auto-induction media in batch fermentation. In a separate study, we look to use enzymatic biocatalysis to complement current methods of producing paclitaxel and related analogues under constant demand. Here, we use (2*R*,3*S*)-phenylisoserine and baccatin III substrates incubated with two enzymes, (2*R*,3*S*)-phenylisoserinyl CoA ligase (PheAT) and baccatin III: 3-amino-13-O-phenylpropanoyl CoA transferase (BAPT) to biosynthesize the precursor *N*-debenzoylpaclitaxel.

DEFINING THE NEUROCHEMISTRY AND CONNECTIVITY OF NEUROTENSIN RECEPTOR-1 NEURONS IN THE LATERAL PREOPTIC AREA
Cristina Rivera (Universidad de Puerto Rico en Cayey)
Category & Time: Biochemistry and Molecular Biology, Section 8, 2:30 PM - 3:45 PM
Poster: 82
Mentor(s): Gizem Kurt (Physiology)

The lateral hypothalamic area (LHA) has been known to regulate feeding and drinking. Different neuronal populations have been identified in the LHA, including neurotensin (Nts) expressing ones. LHA Nts neurons regulate water intake and project to the lateral preoptic area (LPO). Nevertheless, not much is known about the way the LHA Nts to LPO circuit works. The Leinninger lab studies LHA Nts neurons to understand this circuit and how it functions. Genetically modified mice that express cre-recombinase in NtsR1 neurons (NtsR1Cre mice) were utilized to visualize Nts responsive neurons in LPO. It's also crucial to characterize the Nts responsive neurons in LPO and acetyl choline is one of the potential neurotransmitters that LPO NtsR1 neurons may express. Therefore, our working hypothesis is that LPO NtsR1 neurons are cholinergic and are projecting to other brain areas important for ingestive behavior to regulate drinking. The first aim of the project is to visualize LPO NtsR1 neurons by injecting cre-inducible synaptophysin-mCherry adenoviral vector, which labels soma and projections of neurons as red, into LPO of NtsR1Cre mice and co-stain for the acetyl choline transferase (ChAT), indicator of cholinergic neurons, to observe whether they co-localize. The second aim is to determine the projection sites of LPO NtsR1 neurons by screening the same adenoviral vector injected brains. The anticipated results of this project are to understand whether LPO NtsR1 neurons are cholinergic and to define the physical circuit that might potentially control drinking behavior.

CHARACTERIZING E. COLI MOTILE BEHAVIOR IN VARIOUS MUCUS VISCOSITIES
Qaleelah Smith (Bennett College)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 83
Mentor(s): Yann Dufour (Microbiology and Molecular Genetics)

Mucus- mainly composed of mucins (sugar proteins)- is located on the lining of internal organs and protects epithelial cells by preventing bacteria and other pathogens from moving through. Mucus must be permeable enough for nutrients to go through, yet impermeable to opportunistic bacteria that try to penetrate, colonize, and infect the mucus layer. Bacterial pathogens can compromise the mucus layer to access and infect epithelial cells. Previous studies have shown that flagellar motility is an important virulence factor because when motility is disrupted virulence will decrease in many pathogenic bacteria. Mucus is a viscoelastic material and its characteristics can be measured using rheology. To obtain a better understanding of how mucus prevents bacterial motility, we will investigate the viscous and elastic components independently from each other. Our hypothesis is that by exposing *Escherichia coli* to various viscous environments, there will be an evident change in the speed and directional persistence of the cells. The viscosity of the environment will be changed using different concentrations of polyvinylpyrrolidone (PVP). Viscosity will be measured by using single-particle tracking video-microscopy to calculate the diffusion coefficient of micro-beads and the viscosity of the environment. The behavior of *Escherichia coli* in different viscosities will also be characterized using single-particle tracking and computer analysis. Direct and detailed observations of how motile bacteria navigate viscoelastic environments will help us understand how pathogens compromise the mucosal defense and can help us design strategies to prevent bacterial infections.

PHYTOCHROME INDUCED SIGMA FACTOR (SIG2) CONTRIBUTES TO PHOTOMORPHOGENESIS IN ARABIDOPSIS THALIANA
Olivia Stephens (Spelman College)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 84
Mentor(s): Beronda Montgomery (Plant Research Laboratory), Sookyung Oh (Plant Research Laboratory)

Light affects growth and development in a plant's life cycle. Plants possess photoreceptors such as phytochromes that enable them to capture and respond to red and far-red light. Our previous data indicated that phytochromes are required to regulate Sigma Factor 2 (SIG2), a chloroplast transcriptional regulator that impacts chloroplast development and plant growth. In a light-grown phytochrome mutant, there is a decrease in the expression of *SIG2*, suggesting that phytochrome positively regulates the transcription of *SIG2*. Red and far-red light-grown *sig2* mutants showed pleiotropic phenotypes, such as small pale-green cotyledons and a long hypocotyl, suggesting a connection between SIG2 and phytochromes in photomorphogenesis. To investigate the role of SIG2 in phytochrome-mediated photomorphogenesis, the effect of ectopic overexpression of *SIG2* on the development of Arabidopsis plants will be tested. A homozygous single-copy insertional transgenic line harboring *35S*::*SIG2-YFP-HA* will be identified at the T3 generation. Next, the expression of *SIG2* and the accumulation of its protein in the transgenic lines will be quantified by qRT-PCR and western blot analysis, respectively. The hypocotyl length, chlorophyll accumulation, and localization of HA-tagged SIG2 protein will be analyzed under different light conditions. Findings from this proposed study will be important to understand SIG2 influence on the phytochrome-mediated transcriptional regulation and photomorphogenesis.

THE ROLE OF TRANSLOCATOR PROTEIN (TSPO) AND THE ARYL HYDROCARBON RECEPTOR IN MODULATING MITOCHONDRIAL FUNCTION
Ayman Taher (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 85
Mentor(s): Elahe Crockett (Medicine), John LaPres (Biochemistry), Michelle Steidemann (Biochemistry)

The aryl hydrocarbon receptor (AHR) is a ligand activated transcription factor responsible for regulating the expression of a wide battery of genes. The most widely studied ligand of the AHR is 2,3,7,8 tetrachlorodibenzodioxin (TCDD). Upon binding the AHR, TCDD induces a wide range of toxic responses, including immune suppression and metabolic syndrome. In the absence of ligand, the AHR was thought to exist only in the cytosol, however, we have recently demonstrated that the receptor could be found in the inter-membrane space of the mitochondria. The role of mitochondrially localized AHR is unknown and we hypothesize that it works in conjunction with the translocator protein (TSPO) to modulate the cellular response to oxidative stress. Methods/Results: To address this hypothesis, BV2 microglial cells are exposed to potassium tellurite, a metal known to induce oxidative stress, in the presence and absence of ligands for TSPO and/or the AHR. We have shown that BV2 cells are sensitive to tellurite-induced toxicity in a dose-dependent manner. Moreover, we have shown that TSPO and AHR ligands can shift this dose response relationship, suggesting that these proteins play a role in modulating a cells response to oxidative stress. Conclusion: TSPO and the AHR can alter the cell response to tellurite-induced toxicity. Moreover, these results suggest that these proteins are capable of altering mitochondrial function to help cope with oxidative stress. Support: A.T. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

GENETIC AND CHEMICAL MUTATIONAL ANALYSIS OF ORYZA SATIVA TYROSINE AMINOMUTASE (OSTAM)
Sydney Thomas (Suffolk University)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 86
Mentor(s): Gayanthi Attanayake (Chemistry), Kevin Walker (Chemistry)

Recent discovery of the contributions of aminomutases to biosynthesis pathways raises great interest in its ability to solving plaguing diseases that bind humans to terminal illnesses. Aminomutase is a biocatalysts that execute chemically challenging isomerization of α-amino acids to β-amino acids by exchanging a vicinal hydrogen atom and an amine group. β-amino acids are vital to biosynthesis in a variety of natural products such as anti-cancer drug taxol3 found in Yew species that supplements the chemotherapy drug. Tyrosine aminomutase (TAM) isolated from the rice plant Oryza sativa (OsTAM) makes β-tyrosine (75%) and p-coumarate (25%) from α-tyrosine.1 OsTAM is the first TAM to have faint analogic to phenylalanine aminomutase (PAM) activity. The active sites of OsTAM and TcPAM from Taxus plants differ by only two residues (Y125 and N446 of OsTAM vs C107 and K427 of TcPAM) positioned similarly near the aryl ring of their substrates. Substrate selectivity was studied for OsTAM individual mutants Y125C and N446K OsTAM and double mutant Y125C/N446K OsTAM.1 The differentiating factor of this research is the variance of substituent's of phenylalanine to study about the role of residues for substrate binding in the active site of OsTAM. Fluoro substituted and methyl substituted phenyalanine substrates exhibited significant change with double mutant compared to wild type. As a predicative stance, an aspect of optimization will become a part of this research due to different interactions within the active site that will give varying percentages of both β-phenylalanine and cinnamate intermediate.

ROLE OF ARYL HYDROCARBON RECEPTOR WITHIN THE MITOCHONDRIA
Clayton Trevino (St Mary's University)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 87
Mentor(s): Hye Jin Hwang (Biochemistry & Toxicology), John LaPres (Biochemistry & Toxicology)

The halogenated aromatic hydrocarbon 2,3,7,8 tetrachlorodibenzo-p-dioxin (TCDD) is a known toxic byproduct from various industrial processes. Exposure to TCDD can induce a variety of toxic endpoints in mammals, such as immune suppression, birth defects, and metabolic diseases. The aryl hydrocarbon receptor (AHR) is a ligand-activated transcription factor responsible for mediating most of these toxic effects. In the presence of TCDD, the AHR translocates from the cytoplasm to the nucleus and alters the transcription of a wide battery of genes, including those that encode detoxifying enzymes. Previous studies have shown that TCDD-induced AHR signaling correlates with mitochondrial dysfunction and that a certain portion of AHR in cells is located within the mitochondria (mitoAHR). Given its role as a transcription factor, this localization suggests that mitoAHR is capable of regulating the expression of mitochondrial-encoded genes. To investigate this hypothesis, mitochondria from the liver of wild-type and AHR knockout rats were isolated, exposed to TCDD or vehicle control (dimethyl sulfoxide), and analyzed for mitochondrial-encoded gene expression by quantitative polymerase chain reaction. The results will show whether mitoAHR functions as a mitochondrial transcription factor. This will allow for a better understanding of how halogenated hydrocarbons induce mitochondrial dysfunction and lead to metabolic diseases.

IDENTIFICATION OF UPR MECHANISMS IN ARABIDOPSIS USING ER STRESSORS
Samuel Vaitkevicius (Michigan State Univiersity)
Category & Time: Biochemistry and Molecular Biology, Section 9, 2:30 PM - 3:45 PM
Poster: 88
Mentor(s): Federica Brandizzi (Plant Research Laboratories)

The Unfolded Protein Response (UPR) is an essential defensive mechanism used by plants and animals alike in order to defend against environmental stressors. This process is mainly associated with the Endoplasmic Reticulum (ER) and, at times, can dictate the cellular process of apoptosis. When a cell has been affected by an ER stressor, take extreme heat for example, the UPR jumpstarts a cascade of protein pathways that notify the nucleus to either adapt or prepare for cellular death. In the research I have preformed, I have identified and explored a protein that takes a very essential role in this stress response. The protein in question is Bzip60 and until recently, has very rarely been researched.

THE EFFECTS OF THE MINERALOCORTICOID RECEPTOR IN PARENCHYMAL ARTERIOLE TRPA1, TRPV4, INTERMEDIATE AND SMALL CONDUCTANCE CALCIUM-ACTIVATED POTASSIUM CHANNELS EXPRESSION IN HYPERTENSIVE MICE
Jesica Vicente-Reyes (University of Puerto Rico at Cayey)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 90
Mentor(s): Janice Diaz-Otero (Pharmacology & Toxicology), Anne Dorrance (Pharmacology & Toxicology)

Hypertension impairs cerebral artery vasodilation, this reduces cerebral perfusion and increases the risk of stroke. Mineralocorticoid receptor (MR) blockade prevents endothelial dysfunction and artery remodeling, but the mechanism is not defined. In peripheral arteries, MR activation alters the intermediate conductance (IKca) and small conductance (SKca) calcium-activated potassium channels that contribute to vasodilation. These channels are activated by intracellular calcium or by calcium influx through transient receptor potential (TRP) channels including TRPA1, channel that has only been found in the brain, and TRPV4. How MR activation alters these channels and vasodilation in cerebral arteries is unknown. The parenchymal arterioles (PAs) perfuse the cerebral microcirculation and determine the outcome of stroke. We hypothesize that angiotensin II (AngII) hypertension will decrease IKca, SKca, TRPA1, and TRPV4 channel expression causing impaired endothelium-dependent dilation in PAs. MR antagonism with eplenerone (EPL) will prevent the changes in channel expression. To induce hypertension, 16-week-old male C57Bl/6 mice were treated with AngII (800ng/kg/min) subcutaneously for 4 weeks via osmotic minipumps. To test the role of the MR a group of mice were treated with EPL (100mg/kg/day) during the 4 weeks of the AngII infusion. Sham operated mice served as the control. At 20 weeks mice were euthanized and brain was collected to immunolabel and measure mRNA expression of the IKca/SKca, TRPA1, and TRPV4 channels in the PAs. It is expected that AngII will decrease SKca/IKca, TRPV4 and TRPA1 channels expression and EPL treatment will prevent this. Our studies can help to develop therapeutic mechanism to prevent vascular impairments.

THE EFFECTS OF ISCHEMIC STROKE ON CARDIAC INFLAMMATION IN NORMOTENSIVE RATS.
Kinnon Ward (Tuskegee University)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 91
Mentor(s): Anne M Dorrance (Pharmacology & Toxicology)

Stroke is the leading cause of disability worldwide. In patients, stroke can lead to cardiac complications increasing the risk of death. Studies suggest that ischemic stroke causes cardiac injury in response to elevated activity in the nervous system. It is unclear if cardiac inflammation occurs as a result of injury after the stroke. Macrophages are a key component of the inflammatory processes. We hypothesize an increase in M1 macrophage activity will cause cardiac inflammation in normotensive Sprague Dawley (SD) rats following ischemic stroke. Ischemic stroke was induced in 18 week-old male SD rats by middle cerebral artery occlusion (MCAO). After 1 hour of ischemia, the rats were divided into two groups; one group of rats was euthanized 24 hours following stroke and the other 7 days. Sham operated rats were used as controls. Real Time-PCR will be performed to measure mRNA expression of M1 pro-inflammatory markers interleukin-1 beta (IL-1β) and tumor necrosis factor alpha (TNFα) along with macrophage markers F4/80 and CD68. Cell adhesion molecules such as intracellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and monocyte chemoattractant protein-1 (MCP-1) are released by damaged cardiac cells to signal macrophages. We will be looking at the mRNA expression of these molecules following stroke. We expect an increase in mRNA expression of M1 macrophage markers IL-1β and TNFα along with elevated levels of ICAM-1, VCAM-1, and MCP-1 both 24 hours and 7 days post-stroke. Our findings will help understand the mechanism of cardiac inflammation following ischemic stroke in normotensive rats.

ENGINEERING CYANOBACTERIA FOR IMPROVED TOLERANCE TO FREEZE/ THAW CYCLES

Darwin Warga Kane (Michigan State University), Pamela Himadewi (Michigan State University), Lauren Tamm (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 92
Mentor(s): Daniel Ducat (Biochemistry & Molecular Biology), Bjoern Hamberger (BMB), Michaela TerAvest (BMB), Tim Whitehead (Chemical Engineering & Materials Science), Adam Woodruff (FRIB), Eric Young (BMB)

Sensitive to Freezing 2 (SFR2) is a protein found in the chloroplast outer envelope membrane of Arabidopsis thaliana. Constitutive expression of SFR2 causes remodeling of the membrane's lipid composition, resulting in increased survival in response to freezing conditions. This suggests SFR2 holds an important role in the protection of chloroplast by reducing dehydration and thus improving freezing tolerance. Chloroplasts are thought to arise from an endosymbiotic event originating from cyanobacteria. According to this relation in chloroplast evolutionary history, we hypothesize that SFR2 protein will function similarly in cyanobacteria, by altering the membrane's lipid composition. In this study, we inserted both complete and truncated versions of the SFR2 sequence into the genetic makeup of Synechococcus elongatus PCC 7942 under the control of a tightly regulated riboswitch. The strains were then tested under various environmental conditions to see the viability after becoming subjected to freezing temperatures. Sustainability of organisms throughout harsh conditions can be extremely important in all situations. Therefore engineering a widely used cyanobacteria strain to be compatible regardless of the unpredictable environmental conditions, specifically harsh frosts, is extremely useful in the biotechnology industry.

SEX DIFFERENCES IN 5-HT 3 RECEPTOR SENSITIVITY IN THE ENTERIC NERVOUS SYSTEM OF MICE
Antonio White (North Carolina Central University)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 93
Mentor(s): James Galligan (Pharmacology & Toxicology)

The enteric nervous system (ENS) is the intrinsic neuronal circuit embedded in the gut wall that controls all gastrointestinal (GI) functions. The myenteric plexus (MP) is the division of the ENS that controls gut motility. The myenteric plexus works by neuron to muscle communication through the release of neurotransmitters, especially acetylcholine (Ach) and 5-hydroxytryptamine (5HT). 5 HT is also released from enterochromaffin cells and it binds to 5HT-3 receptors on nerve terminals of intrinsic primary afferent neurons (IPAN). IPANs relays the signal to enteric neurons in the MP to initiate contraction/relaxation. Conversely, extrinsic primary afferent neurons also respond to 5-HT and sends information to the central nervous system (CNS). Myenteric excitatory motorneurons innervate the muscle layers of the gut, releasing acetylcholine (Ach) onto muscarinic receptors causing muscle contraction. The Irritable Bowel Syndrome (IBS) is a GI motility and sensation disease that effects millions of people worldwide especially women. The ongoing project will test the hypothesis that 5HT-3 receptors on myenteric neurons of female mice is more sensitive to stimulation by 5HT compared to the myenteric neurons in male mice. This project will study differences in the ileum of wild type and tryptophan hydroxylase 1 (enzyme that synthesizes 5HT) gene knockout mice. We will use isometric organ bath, fecal output assay and migrating motor complex assay. The outcomes of these studies will lead to better treatments for IBS

COMPARISON OF THE EFFECTS OF BUFFER COMPOSITION ON MITOCHONDRIAL RESPIRATION
Lucas Wollenman (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 94
Mentor(s): Jason Bazil (Physiology)

Mitochondrial respiration is effected by the buffer solution in which the reactions take place. Variations in buffer solutions cause differences in respiration rates, as measured by oxygen consumption. In order to test this, two buffers, a standard KCl-based buffer (RB0) and a modified buffer (MiRO5e) containing K-lactobionate, taurine, and less chloride were used. Guinea pig cardiac myocytes were extracted and the mitochondria were isolated. Both the RB0 and the MiR05e buffers were used with various substrate combinations, and the rate of mitochondrial respiration was measured using the OROBOROS Oxygraph 2k before and after the addition of ADP. Each Substrate combination was used with both buffers, and comparisons were drawn from the mitochondrial respiration rates. The MiR05e buffer yielded higher average rates of oxygen consumption than the RB0 buffer across all substrate combinations, indicating a higher level of mitochondrial integrity and function. This included both resting state respiration and fully activated respiration. In addition, the respiration control ratio (active state / resting state respiration rate) was higher across all substrate combinations with the MiR05e buffer. Thus, based on these results, the MiR05e buffer is a superior mitochondrial respiration buffer compared to the standard KCl-based buffer. Further research is required to understand the mechanisms causing the observed rise in respiration rates and the specific component(s) responsible for the phenomena.

FRESHWATER AEROMONAS VIRULENCE FACTORS AND BIOFILM
Zachary Yarost (Michigan State University), Donna Ye (Michigan State University)
Category & Time: Biochemistry and Molecular Biology, Section 10, 2:30 PM - 3:45 PM
Poster: 95
Mentor(s): Terence L Marsh (Microbiology & Molecular Genetics)

Aeromonas is a gram negative proteobacteria commonly found in freshwater. Under certain conditions, species of Aeromonas can cause diseases in fish and some species have been termed an emerging pathogen of humans. A diverse collection of virulence factors are important in the pathogenicity of Aeromonas. Aeromonas can also form a biofilm, which is a microbiotic lifestyle that contributes to the fitness of an organism by creating a colony with an external protective matrix that resists desiccation and can make the colony more resistant to antibiotics and metals, as well as acting as a trap for nutrient acquisition. We screened forty two isolates of Aeromonas from the Red Cedar River and the Black River for their ability to form biofilm using a spectrophotometric assay and for select virulence factors. We observed different levels of biofilm formation depending on nutrient availability (trypticase soy broth) and exogenous protein, such as TSB and TSB plus protein, as well as by Aeromonas species. We positively identified twelve of the Aeromonas at the species level, and ninety six at the genus level; of the twelve at the species level there were three different species. We will report on the distribution of biofilm formation and virulence factors in the identified phylotypes of Aeromonas.

BIOSYSTEMS AND AGRICULTURAL ENGINEERING

A SELF-SUSTAINABLE WASTE WATER TREATMENT SYSTEM
John Blackhurst (Michigan State)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 98
Mentor(s): Mauricio Bustamante (Biosystems Engineering), Wei Liao (Bioystems Engineering)

Wastewater treatment is a very important component in protecting the environment and conserving natural resources. Since the current wastewater treatment technologies are mostly energy intensive, and require a significant amount of fossil carbon, a self-sustainable treatment concept could make a contribution to the establishment of a carbon neutral wastewater treatment system. Therefore, the focus of this study is on integrating solar, electrochemical, and biological technologies to develop a self-sustaining wastewater treatment system. The studied system includes a high-efficiency up flow anaerobic digester, photovoltaic (PV) panels, and electrocoagulation reactor. The anaerobic digester first reduces the organic matters in the influent (food wastes and blackwater) to generate methane gas. The AD effluent is then treated by electrocoagulation unit to settle down the particles and reclaim the water. The methane energy and PV electricity will be used to power the entire system. A comprehensive mass and energy balance analysis will be carried out by this study to conclude a functioning system.

INVESTIGATION OF THE EFFECTS OF FORMATE AND VITAMINS ON UMBELOPSIS ISABELLINA FERMENTATION
Andrew Brown (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 99
Mentor(s): Yan Liu (Biosystems Engineering), Tony Zhong (Biosystems Engineering)

Transforming greenhouse gas CO2 into higher value carbon based compounds is a topic of interest as global CO2 emissions are rising. Formate is a compound that can be derived from CO2 through electrochemical reduction under mild reaction conditions. Formate as a soluble organic acid could be a better intermediate for microbial CO2 utilization, which makes it possible to combine microbial culture and electrochemical reaction for efficient CO2 fixation and value-added chemical production. Formate has the potential to be both a carbon source and an energy source for a filamentous fungus *Umbelopsis isabellina*, which has also shown the ability to accumulate lipids that can be used for biodiesel production. Therefore, the objective of this study is to investigate the effects of formate on fungal growth and lipid accumulation. Formate concentrations (0 g/L, 5 g/L, 8 g/L), and addition of vitamins were studied to explore the impacts of medium compounds. Kinetic analyses of the fungal growth, lipid accumulation, formate, glucose, xylose and acetate utilizations were carried out to reveal the effects of culture conditions on the fungus to determine the preferred culture conditions for lipid synthesis from fungal fermentation.

EFFECTS OF TEMPERATURE, WATER ACTIVITY, AND STRUCTURE ON THERMAL RESISTANCE OF SALMONELLA IN DATES AND DATE PASTE
Sarah Buchholz (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 100
Mentor(s): Bradley Marks (Biosystems & Agricultural Engineering)

Low-moisture products have been implicated in salmonellosis outbreaks/recalls. However, few studies have addressed *Salmonella* in dried fruits, even though it has been shown to be present and able to survive long periods in such products. Additionally, the effect of structure change (whole fruits vs. fruit paste) on *Salmonella* thermal resistance is not well studied.The objective was to quantify the thermal resistance of *Salmonella* on dates and in date paste during heat treatment at different water activities (a_w). Date surfaces and pitted dates (later processed into paste) inoculated with *Salmonella* Enteritidis PT30 were equilibrated in controlled-humidity chambers to 0.25, 0.45, or 0.65 a_w. Samples were treated isothermally in sealed containers in a water bath (70, 75, 80°C) for defined periods. *Salmonella* survivors were recovered on modified trypticase soy agar, incubated for 48 h, and enumerated. D-values were determined from linear regression of the survivor curves for each treatment. D-values were significantly different ($P<0.05$) between differing temperatures, a_w, and structure types. D-values increased with decreasing temperature, and also when dates were ground into paste. There were differing trends in D-values between different a_w levels. In most food products, increase in a_w decreases thermal resistance of *Salmonella*, but this appeared less true for dates. Other compositional factors may be more important than a_w in this product type. Future studies should continue exploring the effects of these factors to ensure reliable data for process design and validation.

SMALL SCALE CORN FIBER ISOLATION AND CHARACTERIZATION FOR DOWNSTREAM BIOCHEMICAL CONVERSION
Benjamin Gardner (Tuskegee University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 101
Mentor(s): David Hodge (Chemical Engineering), Ryan Stoklosa (Chemical Engineering)

Corn is the most prominent feedstock for producing ethanol in the United States production reaching 36.5 billion gallons of ethanol a year. As corn ethanol production requires only the starch portion of the corn kernel, many byproducts are produced during the bioconversion process. Currently, the dry grind and wet grind process are most prominent for producing ethanol from corn. These processes vary in not only their design but in the types of byproducts produced (e.g. distiller's dry grains (DDG) for dry grind and corn gluten meal for wet grind). The recovery of corn fiber is of interest because it is a versatile product that is currently marketed as corn gluten. Depending on the type of corn cultivar grown, different amounts of corn fiber can be isolated for downstream processing. This research investigates a lab-scale method to isolate corn fiber following sequential organic solvent extractions, and characterize corn fiber properties following pretreatment. Alkaline pretreatment will be performed to determine composition changes with increasing chemical loading. Following pretreatments, enzymatic hydrolysis will be performed to assess the digestibility of corn fiber to monomeric sugar components to demonstrate downstream fermentation capability. While applied as a screening tool, this method may also assess the downstream pretreatment processing properties of corn fiber.

ANTIMICROBIAL BIOELECTRIC EFFECT OF MAGNETIC NANOPARTICLES WITH DC CURRENT
Johnathan Harrison (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 102
Mentor(s): Evangelyn Alocilja (Biosystems Engineering)

Due to the rising antibiotic resistance of pathogenic bacteria, so called "superbugs" have become increasingly commonplace in healthcare systems. Furthermore, bacterial biofilms often prove naturally resilient to antibiotics even without genetic resistance. The lack of alternate, chemically based antibacterial agents that can be used safely on humans or food suggests a non-hazardous and effective physically-based agent must be developed. In this project, iron-oxide magnetic nanoparticles (MNP) functionalized with F#2 functional groups (proprietary) and Magnetic Polyaniline (PAni) were exposed to bacteria in different simulated environments. Then, direct electric current was passed through the MNP for assorted durations, and the MNP were plated on nutrient agar against controls for quantitative analysis. The nanoparticles significantly enhanced the antimicrobial action of a weak or strong DC current in short duration exposure cycles, demonstrating synergistic bactericidal effects. Future experiments might involve development of a MNP coating for catheters or food packaging, and evaluation of direct current as a disinfectant and biofilm deterrent in each of those applications.

STABILIZATION OF RAW BIO-OIL USING ELECTROCATALYTIC HYDROGENTION
Andrew Juergens (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 103
Mentor(s): Christopher Saffron (Biosystems & Agricultural Engineering), Rachael Sak (Biosystems & Agricultural Engineering)

According to the US Energy Information Administration, the US consumed 814.8 million gallons of liquid fuels in 2015. Only a small portion, less than five percent, came from renewable sources. Second generation biofuels originating from biomass cropping systems hold great potential to replace petroleum based fossil fuels, combat climate change, and minimize use of agricultural land that could be devoted to food production. One method of biomass upgrading is through fast pyrolysis, in which the biomass is subjected to temperatures of 400-600°C in the absence of oxygen. The resulting pyrolysis gases are then condensed to form liquid known as bio-oil. Performing pyrolysis in regional facilities increases the bulk density of the biomass, allowing for more economical transportation to a centralized biorefinery for further upgrading. Unfortunately, raw bio-oil has many undesirable traits, such as high moisture content, low energy content compared to gasoline, phase separation during storage, and corrosiveness towards metal containers. Due to its corrosiveness, bio-oil must first be stabilized before transportation. The proposed method of stabilization involves a reduction of reactive organic compounds through a process known as electrocatalytic hydrogenation (ECH). ECH is preferred over traditional stabilization methods due to its ability to operate at mild temperatures (50-80°C) and atmospheric pressure. Reduction of raw bio-oil was performed in an electrochemical H-cell using ruthenium supported on activated carbon cloth as the catalyst. Success of ECH was analyzed using size exclusion chromatography and gas chromatography mass spectrometry.

MODELING VITAMIN C INDUCED DEGRADATION OF ANTHOCYANINS IN TART CHERRY JUICE
Zully Perez Sierra (University of Nebraska-Lincoln), Arrieyana Cartier (Virginia State University)
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 104
Mentor(s): Kirk Dolan (Biosystem & Agricultural Engineering/Food Science), Sunisa Roidoung (Food Science & Human Nutrition), Muhammad Siddiq (Food Science & Human Nutrition)

Anthocyanins are responsible for the red, blue, and purple color found in several fruits and vegetables. They have been reported to potentially reduce oxidative stress, inflammation, and even colon cancer cells. Anthocyanins are prone to degradation during processing and storage of fruit juices. Furthermore, research on juices has shown that the addition of L-ascorbic acid (vitamin C) accelerates the degradation of anthocyanins, thereby resulting in the loss of desired color quality. Therefore, this study investigates antioxidant effect of gallic acid (a natural antioxidant) against vitamin C induced degradation of anthocyanins in tart cherry juice. In addition, the effect of pasteurizing temperature on the degradation was also determined. In the experiment design, Montmorency tart cherry juice concentrate diluted at 15-fold was pasteurized at three different temperatures (75°C, 85°C, and 95°C) and five different concentrations (0mg/100mL to 100mg/100mL) of L-ascorbic acid for treatment one. In treatment two, gallic acid (300mg/100mL) was added to each L-ascorbic acid concentration. Product quality was assessed through anthocyanins and total phenolics contents, red color intensity, and browning index. An ANOVA statistical analysis was performed to determine the significance of the degradation in comparison to L-ascorbic acid concentration, gallic acid, and temperature. The anthocyanins and color degradation were modeled through multiple linear regression using JMP software. Preliminary results show that only the change in

vitamin C concentration gave a significant decrease in anthocyanins. The addition of gallic acid and different pasteurizing temperatures did not significantly affect the degradation of anthocyanins.

EVALUATION OF SOIL MOISTURE SENSORS AS A MEANS TO DETERMINE CROP FIELD IRRIGATION
Davis Roeser (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 107
Mentor(s): Younsuk Dong (Biosystems & Agricultural Engineering), Lyndon Kelley (MSU Extension), Steve Miller (Biosystems & Agricultural Engineering), Steve Safferman (Biosystems & Agricultural Engineering)

Knowing when to irrigate a field is essential for providing optimal conditions for crop growth of any kind and the most efficient use of water. As the field capacity in a crop field is depleted to a level of around 50%, the crops begin to be stressed and their growth is hindered. Farmers do not always use the most efficient methods to determine when their field is in need of irrigation. The research team decided to continue to look at the accuracy and economic feasibility of the use of different brands of ground sensors wired to on-sight data loggers to monitor moisture levels in fields of varying crops in Southwest Michigan and Northern Indiana. Watermark sensors, which measure soil moisture tension, and Decagon sensors, which measure the dielectric constant of the soil, were used at depths ranging from 6" to 36". The sensors provided data that tracks the moisture profile of the field over time, showing how the various depths' moisture content increased and decreased. The team also took soil samples, which were run through pressure plate testing to determine visualize the moisture release curve of the soil, and gravimetric analysis to determine a reference volumetric moisture content of the soil. Rainfall and irrigation was tracked in order to carry out irrigation scheduling. Both the pressure plate experiments and the irrigation scheduling were used to provide a comparison for the sensor data over the Spring and Summer of 2016. Data collection is ongoing.

EFFECT OF FOOD PRODUCT STRUCTURE AND WATER ACTIVITY ON X-RAY INACTIVATION OF SALMONELLA
Philip Steinbrunner (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 108
Mentor(s): Sanghyup Jeong (Biosystems Engineering)

Salmonella contamination of low-moisture foods is an important issue evidenced by the multiple outbreaks and recalls in recent years. Thus, it is critical to develop effective mitigation strategies to reduce foodborne pathogens while maintaining food product integrity. The purpose of this study was to assess the efficacy of X-ray irradiation in inactivating *Salmonella* in almonds (kernels, meal, butter), dates (whole fruit, paste), and wheat (kernels, flour) at various water activities (a_w). Almond kernels were inoculated with *Salmonella* Enteritidis PT30, conditioned to 0.25, 0.45, or 0.65 a_w, and ground into coarse meal. Dates were spot inoculated on the surface of the whole date and conditioned to the target a_w. Bagged samples (~1-4 g) were irradiated utilizing a 70kV X-ray irradiator at doses targeting 1-5 log reductions. Samples were then stomached, diluted, and plated on modified tryptic soy agar, and the survival counts were used to determine D_{10}-values by linear regression. D_{10}-values for whole dates (2.17 and 2.03 kGy at 0.45 and 0.65 a_w, respectively) were insensitive to a_w ($P = 0.64$). However, the D_{10}-values for almond products were significantly ($P < 0.05$) lower than for the dates (e.g., 0.51 kGy for 0.45 a_w almonds and 0.74 kGy for 0.65 a_w almond meal). X-ray irradiation is a viable, non-thermal tool that can effectively reduce bacterial population in low-moisture food products without significant impact on overall food quality, as shown in a prior study. However, the effects of product structure and a_w are complex and need to be considered on a case-by-case basis.

DRY CLEANING USED TO ELIMINATE ALLERGENS FROM THE SURFACE OF FOOD PROCESSING EQUIPMENT
Christopher Wells (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 109
Mentor(s): Sanghyup Jeong (Biosystems Engineering)

Food allergies have become more prevalent over the years, leading to a need for more careful processing of food. Even the slightest contamination has the potential to be deadly if it gets into the wrong hands. By using dry cleaning, processing equipment can be cleaned more effectively to lower the instance of unintentional contamination in low moisture environments. Currently, the cleaning method used to clean food processing equipment is vacuuming. Even with special filtered vacuums, it is impossible to get everything clean with this method. Therefore, the purpose of this experiment is to develop a way to completely clean the surfaces of processing equipment including the hard to reach spaces without introducing wet products. Method: This experiment will use a form of high frequency dry cleaning. The system will be evaluated by running different types of nuts and using special allergen testing kits to gather data. Then the results will be statistically compared. The expected result of this experiment is that the dry cleaning system will be fully tested by using a variety of products and hopefully provide a near-future solution to the problems associated with dry cleaning techniques. The use of high frequency dry cleaning is important to the low-moisture industry. Understanding and implementing this form of cleaning could be a viable technique used in the future.

PYROLOSIS BIO-OIL STABILIZATION BY ELECTROCATALYTIC HYDROGENATION
Daniel Young-Farhat (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 110
Mentor(s): Mahlet Garedew (Biosystems Engineering), James Jackson (Chemistry), Christopher Saffron (Biosystems & Agricultural Engineering)

With climate change clearly becoming more prevalent, a search for alternative sources of energy is essential. One way to address this issue is through the development of alternative fuels that displace fossil fuels. Biomass has potential to become a suitable alternative to conventional fossil fuels. Lignin, one of the components of biomass, has great potential to be utilized as a substitute to petroleum-based products. Lignin is a complex organic polymer in plant cell walls, which can be broken into smaller molecules by pyrolysis, a thermochemical decomposition that occurs at elevated temperatures in the absence of oxygen. However, bio-oil has unfavorable properties that would decrease its value as a suitable alternative liquid fuel. This study will investigate the most efficient way to reduce bio-oil model compounds such as phenol, 4-methylphenol, 4-methylguaiacol, 4-ethylguaiacol, 4-propylguaiacol, and eugenol using electrocatalytic hydrogenation (ECH). To implement these experiments, we vary electrolytes on both sides of the voltaic cell to determine what the effect of varying current and pH does to the yield of each desired product. By stabilizing raw bio-oil with electrical work, ECH becomes the keystone of a bioenergy system that uses pyrolysis to deconstruct biomass.

EFFECTS OF TIMING OF APPLICATION ON FATE OF NUTRIENTS FOR WINTER MANURE SPREADING
Corrine Zeeff (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 111
Mentor(s): Steven Safferman (Biosystems & Agricultural Engineering)

The issue of winter manure spreading has become more and more relevant as agriculture has been identified as a contributor to nutrient runoff that is causing eutrophication of the Great Lakes and cyanobacteria issues. Currently, there is little consensus on the specific conditions that lead to the detrimental effects of winter spreading, resulting in proposals to ban winter manure spreading completely. If a farm experiences inopportune manure spreading conditions just before and after the winter season, as can often occur, the recommended 6 months of storage will no longer be feasible. The aim of this research was to determine the effects of soil moisture content and timing of application on the fate of nutrients in winter spreading situations. This was achieved by simulating these conditions in the laboratory using plastic boxes. Different soil saturation levels and either manure on top of snow or snow on top of manure was used to simulate the different conditions experienced by farmers. Manure and snow was applied to frozen soil, thawed, and then subjected to a simulated spring rain event. Drainage hoses were connected to the boxes for both surface and sub-surface runoff, and soluble and non-soluble nitrogen and phosphorus were measured. The hypothesis is that early winter spreading has a lesser risk of runoff than late winter spreading, but data collection is ongoing.

FUNGAL TREATMENT OF LIGNOCELLULOSIC MATERIAL TO ENHANCE ANAEROBIC PRODUCTION OF VOLATILE FATTY ACIDS
Yujia Zhang (Michigan State University)
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 112
Mentor(s): Yan Liu (Biosystems & Agricultural Engineering)

Efficient deconstruction of biomass cell walls to liberate sugars is one of the most critical steps for lignocellulosic biorefinery. Current technologies for biomass deconstruction rely on thermochemical processing, which degrades the biomass and results in accumulation of toxic inhibitors. These harsh and energy intensive pretreatments need to be replaced by more benign procedures. Economical enzymatic pretreatment is one of those methods that would have greater potential for lignocellulosics biorefinery. Therefore, the objective of this project is to develop a biological process to treat lignocelluosic feedstock for anaerobic production of volatile fatty acids (VFAs). Solid state fermentation (SSF) will be conducted to treat cover stovers using a filamentous fungus *Trichoderma reesei*. Different amount of cull potatoes (0g, 50g, 100g, 200g potatoes) were mixed with original cover stover and ammonia fiber explosion (AFEX) corn stover as the culture medium. *Trichoderma reesei* cultured on potato dextrose broth (PDB) medium was inoculated on corn stover media and cultured at room temperature 78 Fahrenheit for 7 days. The fungal treated corn stover was then put into anaerobic serum bottles for anaerobic volatile fatty acid production. The cellulase and xylanase activities and VFA concentrations were measured and compared to conclude the best biological treatment condition.

CELL BIOLOGY, GENETICS AND GENOMICS

ROLE OF NEUROTENSIN SIGNALING IN THE VENTRAL TEGMENTAL AREA VIA NEUROTENSIN RECEPTOR-1: A NEURAL CIRCUIT TO SUPPRESS FEEDING?
Bethany Beekly (Gonzaga University)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 115
Mentor(s): Gina Leinninger (Physiology)

The lateral hypothalamic area (LHA) orchestrates feeding behavior by coordinating energy status with motivation to seek and consume food via undetermined mechanisms. We aim to understand how neurons in the LHA expressing the neuropeptide neurotensin (Nts) coordinate feeding and body weight. Pharmacological Nts treatment in the VTA can suppress both homeostatic and hedonic (palatable) feeding, but the endogenous source of Nts to the VTA remains uncertain. LHA Nts neurons project to dopamine (DA) -containing neurons in the ventral tegmental area (VTA) that express Nts receptors 1 (NtsR1) and 2 (NtsR2). To identify the circuits by which LHA Nts neurons modulate the VTA, we examined NtsR1 and NtsR2 expression on VTA DA neurons. Using mice that express green fluorescent protein (GFP) in NtsR1 or NtsR2 neurons, we found that numerous VTA DA neurons express NtsR1, while NtsR2 is predominantly observed on glial cells, suggesting that NtsR1 is

the dominant isoform on VTA DA neurons. We next hypothesized that LHA Nts neurons projecting to the VTA act via NtsR1 to regulate feeding. To examine this, we will selectively activate LHA Nts neurons using DREADDs (Designer Receptors Activated by Designer Drugs) in wild-type mice (WT) and mice lacking NtsR1 (NtsR1KO). We will determine how LHA Nts neurons affect motivated sucrose intake using operant conditioning; and how LHA Nts neurons mediate homeostatic food intake and weight gain after prolonged food-restriction in WT and NtsR1KO mice. These studies will improve our understanding of how the LHA Nts/VTA circuit regulates food intake and body weight.

PLASMIN INCREASES THE EXPRESSION OF MATRIX METALLOPROTEINASES IN BONE MARROW MACROPHAGES BY ACTING ON THE PAR-1 RECEPTOR
Jason Cardwell (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 116
Mentor(s): Bryan Copple (Pharmacology & Toxicology)

Liver fibrosis is a disease in which excess connective tissue is deposited in the liver. This disease has many causes, including hepatitis B, hepatitis C and alcohol. The agents produce chronic liver injury which transforms hepatic stellate cells into myofibroblasts that deposit excess collagen in the liver. Liver fibrosis may advance into cirrhosis, which can be fatal. Treatments for liver fibrosis include liver transplant, antivirals, and cessation of alcohol consumption. Liver fibrosis has been shown to be reversible, even in advanced stages, through an increase in production of matrix metalloproteinases by macrophages. It is unclear what stimulates macrophages to produce MMPs during reversal of fibrosis. Previous studies from our laboratory suggest that plasmin is critical for macrophage production of MMPs during liver injury. Therefore, these studies seek to test the hypothesis that plasmin increases expression of MMPs in bone marrow macrophages of mice by activating protease-activated receptor-1 (PAR-1). To test this hypothesis, wild type mice and PAR-1 knockout mice will be euthanized and macrophages will be derived from their bone marrow. These two groups will be further divided into no treatment groups, and treatment groups, with the treatment group within each genotype receiving plasmin. We expect to see an increased expression of MMPs 8, 9, and 13 in the wild type mice treated with plasmin. We predict that this will not occur in macrophages derived from PAR-1 knockout mice. We hope that identifying the receptor that plasmin acts on will allow researchers to design effective anti-fibrotic drugs.

CHANGES IN GENE EXPRESSION ALONG THE INTESTINES IN DIABETES IN IL-10 KNOCKOUT MICE
Saima Chishti (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 117
Mentor(s): Narayanan Parameswaran (Physiology), Michael Steury (Physiology), Elahe Crockett (Medicine)

Interleukin-10 (IL-10) is a cytokine of the interleukin family that has anti-inflammatory functions in many tissues including the intestinal tract. The intestinal epithelium acts as a selectively permeable barrier whose dysfunction and increased permeability is critical for exacerbating inflammatory conditions in diseases such as diabetes. Hypothesis: There will be an alteration of genes expressed in the intestinal tract of mice after they have been subjected to diabetes, and that cytokines such as IL-10 play a crucial role in regulating the expression of these genes. Method: In this study, wild type (WT) and IL-10 knockout (KO) mice were injected with Streptozotocin to induce type-1 diabetes. After 4 and 12 weeks post-diabetes induction, mice were euthanized, their intestines removed, and a piece of the duodenum, jejunum, ileum, and colon were collected for RNA extraction and qPCR analysis to determine gene expression—to examine whether it changes along the intestinal tract and to further test whether they are different between diabetic and non-diabetic groups in both WT controls and IL-10 KO animals. Results and Conclusion: Diabetes was induced in the mice as determined by increased blood glucose levels, the tissues have been collected and their respective RNA extracted. The next step is qPCR to determine gene expression of various inflammatory cytokines. We anticipate that IL-10-KO mice are likely to express stronger inflammatory response and that the diabetic KO-mice will present the most severe inflammation. Support: S.C. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

THE ROLE OF NRF2 IN THE REGULATION OF IL-17A PRODUCTION BY ACTIVATED T CELLS
David Cook (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 118
Mentor(s): Cheryl Rockwell (Pharmacology & Toxicology)

Nuclear factor erythroid 2-related factor (Nrf2) is a transcription factor responsive to oxidative and electrophilic stimuli, that regulates a number of cytoprotective genes. Nrf2 activators range from reactive oxygen species to electrophilic xenobiotics, one of which is tert-butylhydroquinone (tBHQ), a widely used food additive. Several studies suggest that Nrf2 modulates inflammatory immune responses in numerous murine models. The pro-inflammatory cytokine interleukin-17A (IL-17A) is secreted by T-cells and other immune cell types. Our lab has previously shown that activation of Nrf2 by tBHQ promotes Th2 differentiation. However, the role of Nrf2 in regulating Th17 differentiation is unclear. Thus, the aim of the current studies is to determine the effects of Nrf2 on IL-17A secretion by CD4+ T-cells. For these studies, wild-type and Nrf2-null mouse splenocytes were treated with tBHQ (0.1-1μM) or vehicle (0.01% ethanol) for 30min prior to activation. Following activation, supernatants were collected and concentrations of IL-17A were quantified by ELISA. The data suggests that at various time points (24, 48, 72h) in mixed splenocyte prep, tBHQ had no effect on IL-17A levels and there was no genotype difference in IL-17A production. In contrast, the preliminary data in isolated CD4+ T-cells suggests increased IL-17A secretion by Nrf2-null T cells, which was inhibited by tBHQ. Further studies will be needed to confirm these preliminary results and to determine the role of Nrf2 in the regulation of IL-17A production by activated T-cells.

ENGINEERING IMPROVED SYNTHETIC CYANOBACTERIA/E. COLI CONSORTIA THROUGH ENHANCED SUCROSE UPTAKE AND HETEROLOGOUS SIGNALING MOLECULES
Thien Crisanto (Humboldt State University), Daniel O'Hagan (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 119
Mentor(s): Daniel Ducat (Biochemistry & Molecular Biology), Derek Fedeson (Genetics)

Cyanobacteria are a group of oxygen producing, photosynthetic bacteria. They are arguably one of the most important groups of organisms to have evolved, and their ability to convert light energy into biomass has made them pivotal organisms for the past 3.5 billion years. The model cyanobacterium, Synechococcus elongatus PCC 7942, was previously engineered to secrete high amounts of sucrose under salt stress. One potential approach to capitalize upon this effective sucrose production is to engineer designer cyanobacterial/heterotroph consortia, where the heterotroph converts sucrose into target compounds. Our project aims to improve the stability and utility of such consortia by two independent approaches. In the first approach, we genetically modified E. coli to express the high-affinity sucrose transporter srt1 to improve uptake of sucrose; a current limitation for heterotrophic growth. Using flow cytometry, we tested the fitness of srt1-expressing E. coli under co-culture conditions with the base strain. In the second approach, we hypothesized that an engineered inter-species signal would permit an independent pathway for cyanobacteria to regulate gene expression within E. coli. We split components of natural bacterial quorum sensing pathways, inserting Lux I into S. elongatus to produce the inducer N-acyl homoserine lactone (AHL), and inserting the cognate transcription activator/DNA-binding receptor, Lux R, into E. coli. We hypothesized that the cyanobacterially-produced signal of S. elongatus could be used to initiate transcription of target genes in E. coli. Further investigation and genetic manipulation may stabilize autotroph/heterotroph consortia, enabling applications to alternative energy or bioproduction from synthetic co-cultures.

BIOMETTALURGY: EVOLVING A STRAIN
Rajab Curtis (Rochester Institute of Technology)
Category & Time: Cell Biology, Genetics and Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 120
Mentor(s): Cecilia Martinez-Gomez (Microbiology & Molecular Genetics)

Lanthanides or “rare earth” metals, are a classification of elements on the periodic table whose atomic numbers range from 57 through 71. Lanthanides are extremely precious to everyday life in America. They are used in our computers, laptops, cell phones, and even in the military for weaponry. Due to their unique size, they undergo a phenomenon called lanthanide contraction, making their electron clouds significantly smaller than expected. This property makes them extremely insoluble and thus, very difficult to extract for use. The current method involves strong acids which are not only unsafe but bad for the environment. The naturally occurring bacteria methylobacterium extorquens airborne methylotroph 1 or AM 1, is a bacteria capable of utilizing single carbon compounds to generate formate and complete the serine cycle for energy and biochemical products. In this biochemical pathway a gene mxaf1, a methanol dehydrogenase, is used to take calcium using it as a lewis acid to dehydrate methanol. AM1 also has other naturally occurring genes, xoxf1 and xoxf2, which can use lanthanides as lewis acids for methanol dehydration. These naturally occurring genes give AM1 the unique possibility to be genetically engineered for lanthanide extraction and purification. This would provide a safe alternative for extracting a precious and useful material. Through genetic engineering AM1 will be optimized for the process of lanthanide uptake and through gas layer chromatography these lanthanides will be extracted. The amount of lanthanide extracted will then be compared to current lanthanide extraction methods. This process will be reevaluated and completed until the best possible strain of AM1 is created for lanthanide extraction and one day this strain will be used to extract lanthanides instead of strong acids.

E. CLOACAE TN-SEQ LIBRARY FOR CARBAPENEM RESISTANCE
Dulce Frausto (University of Illinois at Urbana-Champaign)
Category & Time: Cell Biology, Genetics, & Genomics, Section 1, 1:00 PM - 2:15 PM
Poster: 121
Mentor(s): Victor DiRita (Microbiology & Molecular Genetics), Natalia Martin (Microbiology & Molecular Genetics)

Carbapenem Resistant Enterobacteriaceae (CRE) are bacteria which are difficult to treat because they have high levels of resistance to antibiotics and are associated to high mortality rates. Carbapenems are a class of broad-spectrum antibiotics, being active against aerobic and anaerobic gram-negative/positive organisms, which have been heavily relied on for treatment of pathogenic Enterobacteriaceae. *Enterobacter cloacae* is a Gram-negative, rod-shaped bacterium, belonging to the Enterobacteriaceae family, which is part of the normal gastrointestinal tract of 40% to 80% of the general population. However, *E. cloacae* has managed to become one of the most prevalent nosocomial pathogens affecting immunocompromised individuals today due to its ability to develop antibiotic resistant, specifically to carbapenem. The aim of this research is to identify genes involved in carbapenem resistance of this, severely understudied, pathogen. In order to find which gene/s are responsible for carbapenem resistance we will generate a transposon-sequencing (Tn-Seq) mutant library. Previous literature, associate carbapenem resistance with a decrease expression of an outer membrane protein in a clinical isolate of a related bacterium. Based on this we hypothesize carbapenem resistance in *E. cloacae* could be caused by a loss of function mutation. The purpose of the Tn-Seq library is to insert a transposon into each gene of an *E. cloacae* sensitive strain genome in order to interrupt the gene/s of interest, those responsible for carbapenem sensitivity. If successful, this will contribute to understanding carbapenem resistance genes in *E. cloacae* and other Enterobacteriaceae bacteria, eventually leading us to find mechanisms to help prevent or treat carbapenem resistance.

CONSTRUCTION OF RETROVIRAL EXPRESSION SYSTEM FOR THE STUDY OF PREX2 IN MELANOMA
William Davie (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 123
Mentor(s): Kathleen Gallo (Physiology), Sean Misek (Physiology), Elahe Crockett (Medicine)

Melanoma, the deadliest type of skin cancer resulting in approximately 10,000 deaths annually in the US. These cancerous growths develop after unrepaired DNA damage to melanocytes. In humans, melanocytes give colors to structures such as epidermis, hair and irises. Most mutations in melanoma result from ultraviolet radiation from the sun. Interestingly, there is a high frequency of 22.0% mutations in the PREX2 gene. PREX2 is a guanine nucleotide exchange factor that activates Rac, a small GTPase. However, little is known about how PREX2 contributes to melanoma progression. The long-term objective of this research study is to understand the role of PREX2 and its mutant forms in melanoma. To accomplish this, an efficient method to stably express PREX2 in melanoma cells is required. We hypothesize that PREX2 is important for melanoma signaling and progression. An efficient method to stably express PREX2 is required, which can be achieved through the use of retroviral transduction. Currently, I am in the process of subcloning pREX2 from a plasmid construct into a retroviral expression vector, which contains selection markers for stable expression. I will produce retroviruses for infection of human melanoma cells to study the role of PREX2 on melanoma progression. Conclusion: It is expected that these studies will determine the role of PREX2 in melanoma, which will assist in the development of potential therapeutic interventions. Support: W.D. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

THE EFFECT OF SANDSTORM PARTICLES ON ANTIGEN-PRESENTING DENDRITIC CELLS
Danielle Ebelle (Virginia Union University)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 124
Mentor(s): Ning Li (Pathobiology & Diagnostic Investigation)

Asian Sand Dust (ASD) also known as sandstorm is a severe dust wind that originates in the Gobi desert in China. This has led to serious health concerns among many Asian countries due to the worsening of air pollution in China (e.g, extremely high level of particles with aerodynamic diameter < 2.5 [illegible] ASD). Exposure to PM2 associated PM2.5 can induce oxidative stress [activation of Heme oxygenase-1(HO-1)] and inflammatory responses [upregulation of interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF [illegible])] in dendriti were collected on quartz filters using a high volume sampler in 2004 in Baotou, China and extracted with cell culture-grade water. DC will be prepared from the bone marrow of Balb/c mice and stimulated with four sandstorm particle samples and a blank filter extract as the negative control for 16 hours. The levels of IL-6 and TNF [illegible] oxidant enzyme HO-1 will be analyzed by western blot.We anticipate that sandstorm can induce cellular oxidative stress which will be evidence by the upregulation of HO-1. This will be accompanied by increased released of IL-6 and TNF [illegible]. This resea asthma exacerbation as well as information in setting up regulatory guidelines for PM2.5 control in China.

ASSOCIATION OF MAST CELLS WITH ENTERIC GLIAL CELLS IN A PIG MODEL OF IRRITABLE BOWEL SYNDROME
Kaitlyn Fouke (Denison University)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 125
Mentor(s): Brian Gulbransen (Physiology)

Irritable bowel syndrome (IBS), a functional gastrointestinal disorder, affects between 10-20% of humans. The functional aspect of IBS is caused by changes in the neural control of basic gut reflexes within the enteric nervous system (ENS), but the underlying mechanisms are poorly understood. Increasing evidence suggests that immune cells play a significant role in modifying ENS functions in IBS, specifically an increase in mast cells. Here, we tested the hypothesis that mast cells indirectly influence neural activity in the gut through interactions with glial cells. We tested this using a pig model of diarrhea predominant IBS (IBS-d) caused by the emotional stress of premature weaning. The submucosal and myenteric plexuses were microdissected from colons of early and late weaned pigs and processed for dual-label immunohistochemistry with antibodies against tryptase or chymase to identify mast cells and antibodies against glial fibrillary acidic protein (GFAP) to identify enteric glia. Dual-label immunohistochemistry with antibodies against the H1 histamine receptor and GFAP were performed to test if glia express receptors for key mast cell mediators. Images were analyzed using ImageJ software followed by student t-tests. Initial experimentation is underway, but we expect to see more mast cells associated with glial cells in tissues in early weaned than late weaned pigs. Also, we anticipate that the H1 receptor will be predominantly expressed by glial cells but we may observe neuronal labeling. Our data will provide new insights into the gut dysfunction mechanisms of IBS by understanding potential interactions between mast cells and enteric glia.

EXPRESSION OF CITRULLINATED PROTEINS IN THE ENTERIC NERVOUS SYSTEM DURING INTESTINAL INFLAMMATION
Naymar I Franqui-Diaz (University of Puerto Rico at Arecibo)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 126
Mentor(s): Brian Gulbransen (Physiology)

Chronic gastrointestinal inflammation permanently alters gut functions in individuals with inflammatory bowel disease (IBD). It is now clear that permanent gut dysfunction in IBD is primarily driven by changes to the structure and function of the enteric nervous system (ENS) during repeated bouts of intestinal inflammation. However, the inflammatory mechanism that drives ENS dysfunction is still poorly understood. The following work tested the hypothesis that the citrullination of proteins in the ENS contributes to the pathophysiology of IBD. Colitis was induced in male mice C57BL/6 by intrarectal administration of 5.5 mg of 2,4-dinitrobenzenesulfonic acid (DNBS), to determine if citrullination is occurring in enteric neurons and glia during inflammation. Then, mice were divided into a 48 hours and a 3-week recovery group. Under those circumstances, mice were sacrificed and the following macroscopic parameters were assessed: body weight, colon length, adhesion, extent of damage and bowel thickness. On the 48-hour group, inflammatory alterations were visible in DNBS-treated mice. Afterwards, the colons were fixed overnight at 4˚C using Zamboni's solution. Sections of the myenteric and submucosal plexuses of the colon were utilized in both

experimental and control groups to perform an immunohistochemistry (IHC) assay. The tissues were then stained using F95, an established monoclonal antibody, that reacts with natural and synthetic citrullinated proteins. Although the identities of these citrullinated proteins remain largely unknown, the expected outcome is to encounter a greater expression of these proteins in inhibitory motor neurons, which are responsible of controlling smooth muscles contraction in the gut.

ROLE OF LIPIDS IN TIGHT JUNCTION PERMEABILITY
Kent Gamber (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 127
Mentor(s): Julia Busik (Physiology)

Tight junctions play a large role in paracellular permeability between adjacent epithelial cells. Retinal pigment epithelial (RPE) cells create the outer blood retinal barrier. In Diabetes, the disrupted permeability of the outer blood retinal barrier leads to macular edema, overall leading to blindness. Many contributing factors have been studied to show their effect on vascular permeability in diabetes, but the role of lipids has not yet been studied. Very Long Chain (VLC, ≥ C26) Ceramides have been shown to be essential in maintenance of water permeability of skin. We predict that VLCs may also be involved in maintaining proper permeability of the retinal blood barrier as well. Through use of mass spectrometry, the presence of VLC ceramides will be examined in RPE cells. In this presentation I will demonstrate the effect of lipids in tight junction permeability. If we are successful in finding VLC ceramides in RPE cells, this could shed a considerable amount of light on how permeability is regulated in the retinal outer blood barrier.

BILE ACIDS INCREASE HEPATOCYTE TISSUE FACTOR PROCOAGULANT ACTIVITY INDEPENDENTLY OF CELL DEATH
Dolores Garcia (University of San Diego)
Category & Time: Cell Biology, Genetics and Genomics, Section 2, 1:00 PM - 2:15 PM
Poster: 128
Mentor(s): James Luyendyk (Pathobiology & Diagnostic Investigation)

Coagulation cascade activation occurs in patients with cholestatic liver disease, where hepatocytes (i.e., liver parenchymal cells) are exposed to excess bile acids. In mice, bile duct ligation (BDL) recapitulates features of cholestatic liver disease seen in patients. Mice that are deficient in hepatocyte tissue factor (TF), the primary initiator of the coagulation cascade, have significantly decreased coagulation after BDL. However, the mechanisms responsible for increasing hepatocyte TF procoagulant activity in cholestatic liver disease are not known. We tested the hypothesis that pathologically relevant concentrations of bile acids increase hepatocyte TF procoagulant activity. To test this hypothesis, primary mouse hepatocytes were treated with 1 mM taurocholic acid (TCA) and/or 1 mM glycochenodeoxycholic acid (GCDCA), two most abundant bile acids found in the bile of patients with cholestasis. Hepatocyte TF procoagulant activity was assessed by measuring the conversion of factor X to factor Xa, and cell injury/cell death was evaluated by measuring release of alanine aminotransferase into the culture medium. Treatment with either TCA or GCDCA significantly increased hepatocyte TF activity without evidence of hepatocyte necrosis. These results indicate that bile acid exposure increases hepatocyte TF procoagulant activity in vitro. The results suggest a mechanism whereby bile acids may contribute to intrahepatic coagulation in disease settings associated with cholestasis.

GASTROINTESTINAL NEUROINFLAMMATION IN RESPONSE TO TRICHLOROETHYLENE EXPOSURE IN DNTGFβRII MODEL MICE
Erika Glatz (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 130
Mentor(s): Isola Brown (Pharmacology & Toxicology), Brian Gulbransen (Physiology), James Luyendyk (Pathobiology & Diagnostic Investigation)

Inflammatory bowel diseases (IBD) are chronic conditions characterized by bouts of intestinal inflammation that disrupt gut function. Theories suggest that IBD pathogenesis involve an impaired immune response to environmental triggers in genetically susceptible individuals. Yet how these factors influence gut functions through effects on the enteric nervous system (ENS) is poorly understood. Trichloroethylene (TCE) is an environmental contaminant and potential trigger for IBD as findings suggest that it induces inflammation (Blossom et. al, 2008). Here, we tested the hypothesis that environmental contaminants (TCE) contribute to the development of IBD in genetically susceptible individuals through effects on the ENS. We administered TCE or vehicle treatments to wild type (wt) and dominant-negative (dn) transforming growth factor beta receptor 2 (TGFβR-II) mice to investigate the combined effects of environment and genetic factors on gastrointestinal inflammation. We used immunohistochemistry to analyze changes in the gut anti-inflammatory response. Results show that mice receiving TCE treatment had fewer total (P=0.02) and calretinin positive neurons (P=0.01) regardless of their genotype. Vehicle treated dnTGFβR-II mice showed or trended to an increase in an activated macrophage marker CD68 (P=0.0526) and a decrease in calretinin positive neurons (P=0.04). Similarly, dnTGFβR-II mice exposed to TCE exhibited increased MHCII (P=0.01) and CD68 (P=0.02) accompanied by a decrease in calretinin positive neurons (P=0.02) compared to wild type mice receiving a vehicle treatment. Overall, our results suggest that the exposure to toxic environmental chemicals could contribute to the pathophysiology of IBD through effects on the neural control of gut functions in genetically susceptible individuals.

WHAT ADVANTAGES AND TRADEOFFS RESULT OF ENZYMES HAVING SUBSTRATE AMBIGUITY AND CATALYTIC EFFICIENCY USING THE ENZYMES EXAF AND XOXF
Nathan Good (University of Central Florida), Bryan Perez (University of Central Florida), Carly Suriano (University of Central Florida)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 131
Mentor(s): Norma Cecilia Martinez Gomez (Microbiology & Molecular Genetics)

Why are enzymes not as efficient as they can be in nature? What advantages and tradeoffs result of enzymes having substrate ambiguity and catalytic efficiency? We will answer these questions by employing genetic, biochemical and system level approaches in combination with evolution studies with two different methanol dehydrogenases, ExaF and XoxF. These are enzymes that have been recently shown to use rare-earth elements, specifically lanthanides for catalysis. Using directed evolution and deep mutational scanning, we will describe the metabolic response to changes to ExaF when improving its catalytic efficiency to methanol. In addition, by studying kinetically the consequences of using different cofactors (lanthanum, neodimuim, or samarium) we will determine the impact on the cell when the catalytic efficiency of XoxF varies. Together, these studies will allow us to define constraints in evolutionary processes.

THE ROLE OF MIR-200A IN THE NRF2 ANTIOXIDANT PATHWAY IN NSC-34 CELLS
Carina Guerra (University of North Carolina at Chapel Hill)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 132
Mentor(s): William Atchison (Pharmacology & Toxicology), Duanghathai Wiwatratana (Pharmacology & Toxicology)

The nuclear factor erythroid 2-related factor 2 (Nrf2)-antioxidant response element (ARE) pathway involved in antioxidant production plays an important role in combating oxidative stress (OS) in cells. High levels of OS have been implicated in the pathophysiology of several neurodegenerative diseases (NDDs), therefore their regulation is critical to cell survival. In breast cancer and hepatic stellate cells, the Nrf2-ARE pathway's neuroprotective effects can be upregulated by miR-200a through the degradation of inhibitory Kelch-like ECH-associated protein 1 (Keap1) mRNA. The resulting decrease in Keap1 protein levels allows for the increased activation of the Nrf2-ARE pathway, which enhances antioxidant protection against OS. Nrf2-ARE regulation by miR-200a has not been studied in the central nervous system (CNS) and has consequently not yet been applicable in NDD treatment options. The following work seeks to determine whether miR-200a has a regulatory function in the Nrf2-ARE pathway in motor-neuron-like cells called NSC-34. In order to test this, miR-200a expression was transduced into NSC-34 cells using a lentivirus and downstream Nrf2-ARE pathway activity was observed. The expression of Keap1 and Nrf2 was measured using immunocytochemistry and flow cytometry, while downstream antioxidant proteins including glutathione were measured using enzyme linked immunosorbant assays. Results are expected to show that antioxidant proteins produced by the Nrf2-ARE pathway are upregulated compared to controls. This would indicate that miR-200a plays a regulatory role in the Nrf2-ARE pathway in the CNS and that miRNA gene therapy could be a promising treatment option for NDDs.

ARE GENES CONTROLLING CALCIUM HANDLING IN MUSCLE AFFECTED BY DISEASE IN TWO SBMA MOUSE MODELS?
Yazeed Haddad (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 133
Mentor(s): Katherine Halievski (Neuroscience)

Spinal and bulbar muscular atrophy (SBMA) is an androgen-dependent neuromuscular disease that occurs only in men due to a polyglutamine expansion mutation in the androgen receptor (AR) gene. Symptoms include muscle weakness and wasting. Notably, diseased muscle is weak, even when they are not atrophied. Since muscles depend on calcium to generate force, the goal of this project is to determine whether calcium handling mechanisms in muscles are affected by disease, thus possibly explaining the loss of force. One critical protein is the sarcoplasmic/endoplasmic reticulum Ca+2 –ATPase (SERCA), which restores intracellular calcium to resting levels inside muscle fibers. I will use quantitative PCR to examine SERCA1 mRNA in muscle of two mouse models of SBMA: 1) the 97Q model which globally overexpresses polyglutamine expanded human AR, and 2) the myogenic model, which overexpresses wild-type AR exclusively in muscle fibers. Since SERCA1 undergoes alternative splicing, I will examine both the adult and total transcripts. One primer set targets exon 22, which is exclusively present in the adult form, while the other primer set targets all possible transcripts, and thus represents "total" SERCA1 mRNA levels. A reduction in adult, but not total transcripts, will indicate increased expression of the neonatal transcript. I predict that expression of the SERCA1 will be shifted towards the neonatal transcript in diseased muscle as found in other models of disease. Findings may identify a novel target for improving muscle function for patients affected by SBMA.

EFFECTS OF MICRORNA 34B/C IN SH-SY5Y CELLS FOR PARKINSON'S DISEASE STUDY
Emma Hahs (Grand Valley State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 134
Mentor(s): Sok Kean Khoo (Cell & Molecular Biology)

Parkinson's disease (PD) is a neurodegenerative disorder with no cure. The pathological hallmark of PD is the aggregation of alpha synuclein (aSyn) proteins in the neurons in the form of Lewy neurites and Lewy Bodies. Thus, developing new drug therapies that block or reduce aSyn aggregation could potentially stop or slow the disease progression. MicroRNAs (miRNAs) are small, conserved RNAs that regulate gene expression and involve in many important biological processes. Here, we aim to establish a feasible study to evaluate the expression of miRNA-34b and miRNA-34c in a differentiated SH-SY5Y cell line induced with rotenone that replicates PD phenotype. miRNA-34b/c are predicted targets for aSyn and are shown to be down-regulated in PD brain specimens. First, we will study the growth curves of undifferentiated and differentiated SH-SY5Y cells to define the log growth phase. Once the log growth phase of differentiated SH-SY5Y is determined, cell viability will be evaluated with trypan blue in rotenone treated and untreated differentiated cells. Dopaminergic phenotypes will be assessed and confirmed with tyrosine hydroxylase. The expression of miR-34b/c and aSyn will be evaluated using quantitative real time PCR. Once the feasibility of this study is established, we can apply miRNA mimics or inhibitors to this cell model to investigate their effects on aSyn

aggregation. miRNA mimics or inhibitors can increase or reduce the expression of a targeted gene and are potential novel drug agents to improve treatments including PD.

GENETIC FACTORS CONTRIBUTING TO THE FORMATION OF ANTIBIOTIC RESISTANT SMALL COLONY VARIANTS IN STAPHYLOCOCCUS AUREUS
Laura Hesse (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 3, 1:00 PM - 2:15 PM
Poster: 135
Mentor(s): Neal Hammer (Microbiology & Molecular Genetics)

Staphylococcus aureus is a Gram positive pathogen that is a leading cause of skin and soft tissue infections, pneumonia, endocarditis, and bacteremia in the United States. *S. aureus* poses a difficult clinical challenge because of its ability to rapidly develop resistance to antibiotics. One mechanism by which *S. aureus* resists antimicrobial therapies is by adapting a slow growing, respiration arrested state called the small colony variant (SCV) phenotype. To identify the metabolic pathways that support the respiration-arrested growth of SCVs, we performed a genetic screen using a defined transposon mutant library. The respiration inhibitor, zinc protoporphyrin (ZnPPIX) was used to arrest respiration and the mutants that displayed a significant growth reduction in the presence of ZnPPIX were isolated for further analysis. One mutant impaired for respiration-arrested growth mapped to the gene *ispA.* Heme biosynthesis mutants are SCVs commonly isolated from patients persistently colonized with *S. aureus*. To determine if *ispA* is required for the SCV phenotype associated with heme biosynthesis mutants, the *ispA* transposon was transduced into a Δ*hemA* mutant background. The Δ*hemA ispA* double mutant exhibited a reduced colony size compared to the parental *ΔhemA* SCV. The double mutant also displays reduced growth in liquid media and is more susceptible to oxidative stress compared to the parental SCV strain. These results demonstrate that *ispA*-dependent metabolic pathways support the growth of SCVs. Future studies will identify the specific *ispA* pathways that assist the transition to respiration-arrested growth of *S. aureus*.

LPS STIMULATED GRK-2 EXPRESSION IN RESPONSE TO NOVEL ANTI-INFLAMMATORY DRUGS IN RAW 246.7 MACROPHAGE CELLS
Courtney Hughes (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 138
Mentor(s): Narayan Parameswaran (Physiology)

G-protein coupled receptor kinases (GRKs) have been known to play a crucial role in the pathogenesis of inflammatory diseases. GRKs are responsible for regulating desensitization of G-protein coupled receptors (GCPRs), the largest and most diverse membrane receptors in eukaryotes. GRK-2 activity and expression levels have been shown to be effected by inflammatory disease conditions. Previous studies in the Parameswaran lab have shown that through the stimulation of murine peritoneal macrophages with LPS, GRK-2 expression levels will increase. Therefore, we are expanding on this data by stimulating raw 246.7 macrophage cells with LPS to observe the response of GRK-2 expression. Furthermore, novel anti-inflammatory drugs will be tested with LPS stimulated macrophage cells to test the effect of GRK-2 expression and inflammatory response. We hypothesize that GRK-2 levels will increase in response to LPS stimulation; however, expression levels will decrease in the presence of novel anti-inflammatory drugs. METHODS: Raw 246.7 macrophage cells will be grown and stimulated with LPS at specified time marks to demonstrate GRK-2 expression over a 24-hour time period. LPS stimulated raw 246.7 macrophage cells will be western blotted with the GRK-2 antibody to detect GRK-2 expression levels throughout the allotted time period. Novel anti-inflammatory drugs effect and regulation of GRK-2 expression will also be assessed by means of western blotting. CONCLUSIONS: The relationship between GRK-2 expression in response to an infection and novel anti-inflammatory drugs will be understood through use of a histogram.

PRESENCE OF UBE3A GENE IN HIPPOCAMPUS OF ANGELMAN SYNDROME MICE CATEGORY: CELL BIOLOGY, GENETICS, AND GENOMICS
Julian Johnson (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 139
Mentor(s): Lily Yan (Psychology)

Angelman Syndrome (AS) is a neurodevelopmental disorder that causes severe speech impairment, ataxia, intellectual disabilities, and sleep difficulties. AS is caused by the loss of function of the UBE3A, which provides a blueprint for making ubiquitin ligase E3A. The maternal allele of the UBE3A gene is the only active copy in certain areas of the brain due to genomic imprinting, and when this copy is lost or inactivated, from mutation or deletion, there significant problems in nervous system development. Since sleep is primarily controlled in the hypothalamus, we suspect that there may be a collection of neurons in this structure with lost UBE3A genes in AS patients. It is unclear what type of neurons in the brain are imprinted with this gene and why. Our goal is to gain insight on the type of neurons imprinted and their function. In a mice animal model immunocytochemistry techniques, including antibody marking, can be used for localization and isolation of specific proteins. In this case we will use antibodies to mark for the ubiquitin ligase E3A protein. Finding the specific region or cell type in the hippocampus that is possibly responsible for sleep deficits in Angelman syndrome can be the first steps towards developing pharmacological treatment.

THE EFFECT OF CHRONIC BISPHENOL A EXPOSURE HAVING NEGATIVE IMPACT ON ESTROGEN-SENSITIVE GENE EXPRESSION (ER ALPHA & BETA, ERR GAMMA)
Parrish Kelley-Collier (Virginia Union University)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 140
Mentor(s): Robert Croawford (Intergative Toxicology), Norbert Kaminski (Intergative Toxicology)

Production of Bisphenol A (BPA) worldwide is enormous, over 6 billion pounds a year worldwide. It uses include binding with polycarbonate plastics, baby bottles, easy to access water bottles, medical devices, compact discs, dental sealants and canned processed foods. However, Bisphenol A can cause immediate conformational changes within leukocyte activity. Numerous studies show that BPA has an affinity for Estrogen Receptors (ER alpha, ER Beta), and Estrogen Related Receptors (ERR Gamma) that is present on most leukocytes in vivo, in vitro, as well as ex vivo models. Conformational changes to constant BPA exposure to these receptors can cause a decrease in endogenous estrogen and a decrease in overall immune health. Also, It's exposure is almost unanimous among everybody in the general population, which is around 90 percent, being detected in human breast milk, amniotic fluid, and umbilical cord blood. Its most devastating concern to the general population is if BPA can bind to these estrogenic receptors, then they can compromise immune development and function within the fetus. This worry is substantial because estrogen influences the development and survival of immunocompetent cells. The following study was designed to test the hypothesis; The effect of chronic Bisphenol A exposure will decrease estrogen-sensitive gene expression (ER Alpha & Beta, ERR gamma) known to be involved in leukocyte function, proliferation, and composition.

A GENETIC SCREEN OF STAPHYLOCOCCUS AUREUS REVEALS THE ZONE OF CLEARING PRODUCED ON BAIRD PARKER SELECTIVE MEDIUM IS DUE TO THE ENZYMATIC ACTIVITY OF TRIACYLGLYCEROL LIPASE.
Kuan-Ting Lin (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 141
Mentor(s): Phillip Delekta (Microbiology & Molecular Genetics), Neal Hammer (Microbiology & Molecular Genetics)

Baird Parker agar medium (BPM) is used to differentiate coagulase negative staphylococci from the more virulent coagulase positive isolates such as Staphylococcus aureus. On BPM, S. aureus produces convex, shiny, black colonies surrounded by a prominent zone of clearing. The zone of clearing is due to the degradation of egg yolk, the component of the BPM that gives the medium its yellow tinted opaqueness. The degradation of egg yolk has been attributed to lipase and lecithinase activity. However, the enzyme that is directly responsible for the zone of clearing phenotype on BPM has not been identified. To determine the enzyme that causes the zone of clearing, we performed a genetic screen using a S. aureus transposon mutant library. We plated ~2,000 transposon mutants on BPM and identified only a single mutant that did not produce a zone of clearing. That transposon mutant is inactivated for geh, the gene that encodes a triacylglycerol lipase. I confirmed that geh is responsible for this phenotype by performing a backcross using the transposon-disrupted geh mutant and transducing the mutation into wild type S. aureus. The resulting geh backcrossed mutants also demonstrate the loss of the zone of clearing when plated on BPM. I plan to complement the geh mutant to provide additional evidence that the lipase activity is solely responsible for the zone of clearing. These studies reveal that lipase activity encoded by geh is the only genetic requirement for producing the zone of clearing on BPM.

EXPRESSIONAL ANALYSIS OF A HIGH-PERFORMING TRANSGENIC CAMELINA SATIVA
Galen Martin (Warren Wilson College)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 142
Mentor(s): Bibin Paulose (Plant Biology), Danny Schnell (Plant Biology)

In order to ensure sufficient food and fuel in the future, agricultural productivity must increase proportionally to population growth. One target for increasing crop productivity lies in maximizing efficiency in the photochemical conversion of inorganic carbon to fixed carbon during photosynthesis. This process is obstructed in ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCo), which can add both CO2, the desired substrate, and O2, an undesired competitor, to RuBP. In the latter case, the plant must recover RuBP by the costly process of photorespiration. One strategy for combating this issue is found in the alga Chlamydomonas reinhardtii. As an aquatic photosynthetic organism, Chlamydomonas experiences lower CO2 concentrations compared to land plants, as CO2 diffusion rates are lower in water than in air. As a result, Chlamydomonas has evolved a carbon concentrating mechanism (CCM) which sequesters CO2 near RuBisCo, thereby decreasing photorespiration. Engineering this CCM into crop plants would improve photosynthetic efficiency and yield. The gene CCP1 from the Chlamydomonas CCM has been transformed into the oilseed crop Camelina sativa with promising results; these plants have higher yields, improved water use efficiency, and improved nitrogen use efficiency. However, the function of CCP1 remains unknown. In this project, we have identified upregulated genes of interest in a previous transcriptomics screen of CCP1-transformed Camelina. We have designed specific primers for these genes and genes within the same protein family and will validate the results of the RNA-seq data with quantitative reverse transcriptase PCR. The identities of genes upregulated in CamelinaCCP1 will provide insight regarding the function of CCP1.

2,3,7,8 -TETRACHLORODIBENZO-P-DIOXIN (TCDD) -MEDIATED TRANSCRIPTIONAL SUPPRESSION OF EBF1 IN EARLY HUMAN B CELL DEVELOPMENT
Joel Marty (Western Michigan University)
Category & Time: Cell Biology, Genetics and Genomics, Section 4, 1:00 PM - 2:15 PM
Poster: 143
Mentor(s): Norbert Kaminski (Intergative Toxicology), Jinpeng Li (Pharmacology & Toxicology), Ashwini Phadnis-Moghe (Pharmacology & Toxicology)

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) has a wide variety of immunological effects across many species, which are dependent upon the aryl hydrocarbon receptor (AHR) pathway. Human exposure to TCDD has been epidemiologically linked to decreased B cell competence and increased incidences of B cell cancer, possibly due to alterations during B cell development. Previous studies in the lab indicate that TCDD treatment impairs human hematopoietic stem cells (HSCs) to B cell development by suppressing a critical transcription factor early B cell factor 1 (EBF1). Given that AHR is a ligand-activated transcription factor, it is hypothesized that TCDD-AHR complex transcriptionally suppresses EBF1 expression. To test this hypothesis, a lymphoblast pre-B cell line (JM1) will be utilized as the model system. However, preliminary studies show that JM1 cells express low levels of AHR. Hence, our strategy involves transduction of an inducible AHR gene in the JM1 cell line. After confirming transduction, the cells will be transiently transfected by a luciferase reporter driven by EBF1 promoter to test the transcriptional regulation of EBF1 by AHR. Cells will be treated with vehicle control (DMSO) or TCDD and monitored through a functional luciferase assay. It is anticipated that the TCDD-treated cells will exhibit reduced luciferase activity due to the binding of the AHR-TCDD complex to dioxin response elements (DREs) within EBF1 promoter, which inhibits transcription of the luciferase gene. Overall, this study will enable greater understanding of the mechanisms by which TCDD-AHR leads to suppression of EBF1 levels in pre-B cells.

A NOVEL REGULATOR OF BONE REGENERATION
Troy Mitchell (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 145
Mentor(s): Kurt Hankenson (Small Animal Clinical Sciences), Daniel Youngstrom (Small Animal Clinical Sciences)

Our laboratory has identified a circulating cytokine, previously implicated in metabolism and cartilage development, that is strongly correlated with bone regeneration. Gene expression and microarray analysis conducted in our laboratory has revealed that transcription of this protein is upregulated by greater than two orders of magnitude in three different mouse models of bone healing, leading to the hypothesis that it is a novel, potent regulator of osteoblastogenesis. We are currently conducting complimentary in vitro and in vivo experiments designed to elucidate the spatiotemporal regulation of this protein in the context of the stem cell to osteoblast transition. The results of this study will hopefully drive the development of novel therapeutics to combat birth defects, non-healing injuries and metabolic disorders of the skeleton.

LACTOBACILLUS REUTERI 6475 POTENTIATION OF IL-8
Nilusha Navodiya (St Mary's University)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 146
Mentor(s): Narayan Parameswaran (Physiology), Naiomy Rios (Physiology)

Lactobacillus reuteri ATCC PTA 6475 is a probiotic bacteria that secretes beneficial immunomodulatory factors that result in various health related benefits. Preliminary data in the lab has shown that L. reuteri small secretory factors (LR-3kD) can potentiate IL-8 production in in vitro studies using intestinal epithelial cells. IL-8 is a chemoattractant cytokine that can regulate cells proliferation and migration. The MAPK pathways (eg. ERK) are involved in the regulation of IL-8 production in intestinal epithelial cells. Based on this we will be investigating the probiotic influence on MAPK pathways to better understand how L. reuteri increases IL-8. For this, we will be treating colon epithelial cells (SW480) with L. reuteri secreted factor smaller than 3 kilo-dalton (3KD) and LR conditioned medium, while also performing a control experiment simultaneously. Then we will be treating them with 20ng/mL of TNF for different time points of (0, 5, 15, 30, 60, and 90 minutes). Finally, Western Blotting will be performed to assess the protein expression. In this study, we will be using SW480 ATCC® CCL-228TM. Overall, we are expecting to see an increase in the phospho ERK1/2 (one of the MAPKs) in SW480 cells in response to L. reuteri treatment.

DEVELOPING GENETIC TOOLS FOR ENTEROBACTER CLOACAE
Kaylee Newcomb (Virginia Commonwealth University)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 147
Mentor(s): Victor DiRita (Microbiology & Molecular Genetics), Natalia Martin (Microbiology & Molecular Genetics Cvm)

Enterobacter cloacae is a facultative anaerobic bacterium found in the normal gastrointestinal microbiota in humans. However, it is also responsible for nosocomial infections and sepsis in immunocompromised patients, indicating virulence factors for colonization beyond the gastrointestinal tract. Most research has focused on the antibiotic resistant properties of the multiple strains, with limited studies on its molecular mechanisms for colonizing and becoming infectious throughout the body. We aim to develop genetic tools for identifying fitness factors important for colonization in vivo animal models. One method for this is to develop vectors which will be used to introduce markerless deletions and for complementation of mutants in Enterobacter cloacae. Additionally, we are developing a transposon sequence library through conjugation, which subsequently can be used to identify genes important for virulence, resistance to various stresses and colonization.

DETERMINING THE ROLE OF THE AMINO TERMINAL PORTION OF THE LIGHT REGULATING BTB E3 LIGASE IN ARABIDOPSIS THALIANA
Aaron Orellana (Grand Valley State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 148
Mentor(s): Matthew Christians (Cell & Molecular Biology)

Plant growth and development is controlled by the different wavelengths in the electromagnetic spectrum. Phytochrome B, a red and far-red light photoreceptor in plants, plays an integral role in shade avoidance, flowering time, seed germination, and de-etiolation. Proper degradation of this photoreceptor is crucial to the function of these processes. Degradation of this protein occurs via the ubiquitin-proteasome system. The light regulating Bric-a-Brac/Tramtrack/Broad Complex (LRB) protein, in conjunction with CUL3, forms an E3 ligase complex which facilitates the attachment of ubiquitin to phytochrome B. Preliminary research has revealed a highly conserved region of the LRB protein near its N-terminus which may function in controlling rubylation. To determine if the LRBs play a role in rubylation, a truncated version of the LRB gene missing this highly conserved region was inserted into a wild type and a lrb1 lrb2 double mutant Arabidopsis thaliana. To date, phenotypic and immunoblot analysis of homozygous lines featuring the truncated LRBs suggest that the N-terminal region may play a role in their function. Future analysis of these lines will provide insight into the role of this N-terminal region of the LRBs in phytochrome degradation and the function of its E3 ligase complex.

EXPLICATING THE MOLECULAR MECHANISMS OF CGAMP AND DNCV REGULATION IN EL TOR VIBRIO CHOLERAE
Macy Pell (University of Wisconsin-Madison)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 149
Mentor(s): Geoffrey Severin (Biochemistry & Molecular Biology), Christopher Waters (Microbiology & Molecular Genetics)

Vibrio cholerae is the gram-negative bacterium responsible for the diarrheal disease cholera from which seven global pandemics have been recorded. The first six pandemics were caused by the Classical biotype of V. cholerae, while the seventh pandemic, which began in the 1960s, is the result of El Tor biotype infections. Despite the genetic similarities between these two biotypes, the presence of two unique genomic islands, VSP-1 and 2, in the genome of El Tor suggests they may be critical to its supplantation of the Classical biotype. Interestingly, VSP-1 encodes a dinucleotide cyclase, DncV, which synthesizes a novel hybrid cyclic AMP-GMP molecule (cGAMP), first described in 2012. While the pathways and molecular mechanisms regulated by cGAMP have yet to be elucidated, an increase in the intracellular concentration of cGAMP has been linked to the down-regulation of chemotaxis in El Tor: a critical pathogenic behavior. We have identified both a small colony phenotype associated with ectopic expression of DncV in El Tor and a discrete colony morphology driven by the over expression of an enzymatically inactive DncV (DncV*). These phenotypes suggest that DncV plays both an enzymatic and non-enzymatic role in regulating El Tor behaviors. We are screening isolated bacterial colonies for spontaneous mutants that demonstrate insensitivity to ectopic expression of DncV and DncV*. We will then perform whole genome sequencing of these mutants to decode the mechanisms of cGAMP and DncV regulation. Understanding these mechanisms will provide molecular targets, which may be used to develop therapeutic treatments for cholera.

ESTIMATING PROPORTIONS OF MAJOR CELL TYPES IN THE BRAIN FROM COMPOSITE TISSUE GENE EXPRESSION DATA.
Danilo Trinidad Perez Rivera (University of Puerto Rico at Cayey)
Category & Time: Cell Biology, Genetics and Genomics, Section 5, 2:30 PM - 3:45 PM
Poster: 150
Mentor(s): Mark Reimers (Neuroscience Program), Candace Savonen (Neuroscience Program)

The brain is composed of four major distinct cell types, all with different gene expression profiles: neurons, oligodendrocytes, astrocytes, and microglia. Most tissue samples collected from the brain are composed of varying amounts of these cell-types. This limits our ability to compare gene expression data from brains of distinct origins due to the inability to recognize if the differences in gene expression are due to up or down regulation of genes of interest, or changes in the proportions of each of the distinct cell-types. Our laboratory proposes to address this issue by constructing a weighted linear model that would permit the estimation of cellular proportions in a sample, by combining expression profiles of stable genes obtained from single-cell-type measurements to best approximate the observed expression patterns of tissue samples. These profiles are built by carefully selecting genes that demonstrate an independence of the transient states the distinct cell-types may assume, assuring them to serve as stable markers. The method is applied to the extensively characterized Allen Brain Atlas and human brain data from several studies to validate its precision and effectiveness.

IDENTIFYING MSDIN GENES IN LEPIOTA SUBINCARNATA
Julia Portocarrero (Smith College)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 152
Mentor(s): Kevin Childs (Plant Biology)

Amatoxins are poisonous toxins produced by four genera of mushrooms, and are the cause of the most mushroom-poisoning deaths. The four genera (Amanita, Conocybe, Galerina, and Lepiota) that have been found to produce these toxins may have gained this similarity through horizontal gene transfer, convergent evolution, or through a common ancestor. The MSDIN gene family codes for amatoxins; these genes contain a hypervariable region flanked by conserved sequences that is cyclized into a peptide toxin. When ingested, the toxin moves through the body and inhibits RNA Polymerase II, primarily affecting the liver. There are many poisonous Lepiota mushrooms, but it is unknown whether they contain the MSDIN genes as found in Amanita and Galerina. To identify MSDIN genes, we will assemble the genome of the poisonous mushroom Lepiota subincarnata. In this experiment, the genes from two samples of L. subincarnata were sequenced using Illumina HiSeq and MiSeq, generating over 65Gbp of data. These libraries were cleaned and their quality analyzed using Trimmomatic and FastQC. The cleaned reads will be assembled using ABySS (Assembly by Short Sequences) and ALLPATHS-LG pipelines. Genome size was estimated using k-mer analysis and ABySS assembly statistics. NCBI BLAST and JBrowse will be used to search for MSDIN gene alignments in the best draft

assemblies. Preliminary results suggest a genome size of 30-40 Mbp and the presence of at least four MSDIN genes in the L. subincarnata genome.

CERAMIDE IMPORTANCE IN MITOCHONDRIAL ACTIVITY FROM MOUSE RETINAS
Jariel Ramirez (University of Puerto Rico at Cayey)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 153
Mentor(s): Julia Busik (Physiology)

Mitochondria are the essence of eukaryotic life and, as studies suggest, the reason for many diseases affecting humanity, including diabetes-related diseases. Diabetic retinopathy (DR) is a sight threatening disease and available treatments are very limited and highly invasive. Our previous studies have demonstrated that upregulation of the central enzyme of sphingolipid metabolism, Acid Sphingomyelinase (ASM) converting sphingomyelin to ceramide critically contributes to retinal inflammation and endothelial cell apoptosis in DR. Moreover, recent studies established an important connection between ceramide in the mitochondrial membrane and mitochondrial function, as well as inflammation and apoptosis. The purpose of this study is to determine the role of ASM upregulation and ceramide production in mitochondrial function. Wild type control and ASM-/- mice were used in this study. Mitochondria were isolated using differential centrifugation and mitochondrial activity was measured using NeoFox fluorescent oxygen sensor. Total mitochondrial protein was measured via Bradford Assay. Liver of ASM-/- mice was found to be heavier than that of the WT mouse, 2.6g vs 1.3g respectively. Mitochondrial isolation from the livers yielded _____mg/mL mitochondrial protein in the WT mouse whereas mitochondrial isolate from ASM -/- yielded _____mg/mL mitochondrial protein. The yields were adequate to generate Respiratory Control Ratio in each mouse, a general mitochondrial fitness parameter. Decreasing ceramide levels in the mitochondria through ASM inhibition should help improve mitochondrial function and protect cells from mitochondrial damage in diabetic retinopathy. Future work will focus on elucidating the mechanistic implications of ASM activity on mitochondrial function in metabolic disease.

THE ROLE OF MIR-200A IN REGULATING KEAP-NRF2-ARE PATHWAY MRNA EXPRESSION IN MOTOR NEURONS
Isabella Reichardt (University of Wisconsin- Madison)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 154
Mentor(s): William Atchison (Pharmacology Toxicology), Duanghathai Noge Wiwatratana (Pharmacology Toxicology)

Oxidative stress (OS) has been implicated as a component in the pathogenesis of multiple neurodegenerative diseases (NDDs), including amyotrophic lateral sclerosis (ALS). The nuclear factor erythroid 2- related factor 2 (Nrf2)- antioxidant response element (ARE) pathway is known to combat OS within the central nervous system (CNS) by stimulating the transcription of hundreds of cytoprotective and antioxidant genes. Under normal conditions, Kelch-like ECH-associated protein 1 (Keap1) suppresses Nrf2 by subjecting it to proteasome degradation in the cytoplasm. Recent studies have shown that microRNA(miR)-200a can bind to Keap1 mRNA in breast cancer and hepatic stellate cells. This inhibits Keap1 mRNA translation, allowing Nrf2 to translocate to the nucleus. Once there, Nrf2 binds to the ARE regions, thereby initiating transcription of antioxidant genes. However, the relationship between miR-200a and Keap1 has not been studied in the CNS. The aim of the following work is to determine if miR-200a can regulate the Nrf2-ARE pathway within motor neurons. A lentivirus transfection system was used to transduce miR-200a expression into NSC34 motor neuron like cells. The mRNA levels of Keap1, Nrf2, Excitatory amino acid transporter 3 (EAAT3), Glutamate Cysteine Ligase Catalytic subunit (GCLC), Thioredoxin reductase (TxnR), and NAD(P)H: quinone oxidoreductase-1 (NQO1) will be measured after transduction using quantitative real time polymerase chain reaction (qPCR). Our expected results are a downregulation in Keap1 mRNA and an upregulation in the mRNA of EAAT3, GCLC, TxnR, and NQO1. Nrf2 mRNA, itself, may be upregulated or remain stagnant.

A GENETIC APPROACH TO CHARACTERIZE THE NOVEL SECOND MESSENGER CYCLIC-GMP-AMP DEPENDENT REGULATION OF CHEMOTAXIS IN VIBRIO CHOLERAE
Christopher Rhoades (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 155
Mentor(s): Geoffrey Severin (Biochemistry & Molecular Biology), Christopher Waters (Microbiology & Molecular Genetics)

Vibrio cholerae, a pathogenic Gram-negative bacterium responsible for the disease cholera, utilizes a complex regulatory network to regulate virulence factor expression and pathogenicity. The latest *V. cholerae* biotype, El Tor, has supplanted Classical *V. cholerae* strains notably due to the acquisition of two novel gene islands, VSP-1 and VSP-2. These novel El Tor gene islands encode additional proteins necessary for biofilm formation and chemotaxis, of which both have been linked to the increased survivability of the bacterium within the gut of a human host. While the majority of genes in these islands remain to be characterized, the gene VC1079 encodes for a dinucleotide cyclase, DncV, whose predominant product is the hybrid cyclic nucleotide, cyclic-GMP-AMP (cGAMP). cGAMP is the newest described bacterial second messenger whose function has just begun to be explored. However, it has been shown that increased intracellular concentrations of cGAMP down regulate the chemotaxis genes in El Tor. Within a host, reduced chemotaxis is critical to El Tor's pathogenicity but the molecular mechanisms involved in this cGAMP-mediated repression are unknown. I will determine this molecular pathway by inducing strong selective pressures for the evolution of chemotaxis mutants that resist cGAMP induced chemotactic inhibition. Whole genome sequencing of suppressors will reveal genes involved in cGAMP mediated chemotactic repression. Chemotactic regulation is vital to *V. cholerae* pathogenicity and knowledge gained from this research will provide clues to understanding the enhanced pathogenic capacity of the El Tor biotype and cGAMP's role in virulence.

ACTIVATION OF MAST CELLS IN ALLERGIES AND IN ASTHMA
Deja Rice (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 156
Mentor(s): Hariharan Subramanian (Physiology)

One in 12 people suffer from asthma with the rate constantly increasing, while 1 and 5 people are affected by allergies and billions of dollars are spent annually for hospitalizations and treatments. In early childhood certain environmental pollutants and viruses can cause allergic diseases including asthma. When mast cells are activated by certain pathogens they release granules including histamines, which causes allergy like symptoms including, but not limited inflammation. Mast cells play a central role in maintaining the internal environment of the body through surface cell receptors, which allow them to respond quickly to tissue compromise to initiate inflammation and repair. The goal of our lab is to learn more about the molecular signals that regulate mast cells, and also to learn more about the mechanism through which environmental exposure to pollutants and viruses can amplify mast cell-mediated asthma. We hypothesize that the stimulation of mast cells with particulate matter (PM) from polluted areas will increase degranulation of mast cells. Methods: Using bone marrow mast cells (BMMC) from two strains of mice, BALB/C and C57/BL6. The mast cells are stimulated with PM and the absorbency is calculated. Raw data of absorbency rates are used to make a histogram of the degranulation percentages and calculate which concentration had the most affect. Conclusions: Progression in the research of mast cell pathophysiology can help decrease the number of people hospitalized yearly as well as decrease the cost used to treat the symptoms as well as help target novel drugs.

MECHANISM OF G2/M ARREST CAUSED BY CEP-1347 ON MCF-7 CELLS
Hiba Saifuddin (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 6, 2:30 PM - 3:45 PM
Poster: 157
Mentor(s): Susan Conrad (Microbiology & Molecular Genetics)

Patients with estrogen receptor positive tumors that are typically treated with antiestrogen often acquire resistance to the therapy resulting in its failure. Therefore, additional or more effective therapy is necessary to treat tumors. This project will investigate the mechanism of cell cycle arrest of the pan MLK inhibitor, CEP-1347 and its target, MLK3, on MCF-7 cells. MLK3 is a mixed-lineage kinase who family members include MLK1-4, DLK and LZK. CEP-1347 can inhibit all members of the family but is MLK3 selective. According to qPCR data, MLK3 was found to have higher expression in tumorigenic cell lines. Therefore its function in the cell cycle and how it interplays with CEP-1347 is important in tumorigenesis. Knocking down MLK3 will allow us to examine differences between absence of MLK3 protein and decreased enzymatic activity by CEP-1347 treatment to determine if the effect of CEP-1347 is due to MLK3. CEP-1347 also causes abnormal spindle formation during mitosis which could be a mechanism leading to G2/M arrest. This suggests that CEP-1347 inhibits a protein or kinase involved in spindle formation such as Aurora B Kinase. Aurora B Kinase functions in attaching the mitotic spindle to the centromere. The question that remains is whether CEP-1347 directly inhibits Aurora B as an additional target or acts through MLK3. Results indicate that CEP-1347 behaves similarly to an Aurora kinase inhibitor. On going experiments are looking into Aurora B Kinase activity upon treatment of CEP-1347 and MLK3 knockdown with existing chemotherapeutic agents, Nocodazole and Taxol, for comparison.

DEVELOPMENT OF A NOVEL METHOD FOR ASSESSMENT OF MITOCHONDRIAL RESPIRATION IN DIABETIC RETINA
Anand Saripalli (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 160
Mentor(s): Julia Busik (Physiology), Elahe Crockett (Medicine), Denis Proshlyakov (Chemistry)

Diabetic Retinopathy (DR) is a devastating diabetic complication that can lead to blindness. It is well accepted that mitochondrial dysfunction plays an important role in the pathogenesis of diabetic retinopathy; however accurate measurements of mitochondrial respiration in scarce tissue such as retina are very challenging due to limitations of currently available methodology. This study focused on developing a novel microfluidic based respirometer coupled with magnetic nanoparticle based isolation. Mitochondria were isolated from mouse livers using differential centrifugation, MACS beads and magnetic nanoparticles conjugated to anti-TOM-22 antibody approach. Mitochondrial respiration was measured using NeoFox fluorescent oxygen sensor in both conventional and microfluidic chamber. Conventional NeoFox oxygen sensor required mitochondrial isolation from ~700mg of tissue to achieve the detection limit. Microfluidic devise reduced tissue requirements to ~70mg making it possible to analyze mouse retinal mitochondrial metabolism from one animal. To further improve sensitivity, we first used MACS beads-based isolation, however MACS beads 50nm size and magnetic strength did not allow for concentrating bead-bound mitochondria in the microfluidic chamber. To overcome this problem, larger 300nm magnetic nanoparticles were used. We have demonstrated that magnetic nanoparticles can be used to concentrate mitochondria in the microfluidic chamber. Magnetic nanoparticles-based mitochondria isolation coupled with microfluidic respirometer approach could allow for reliable measurements of changes in mitochondrial metabolism between control and diabetic retinas. Support: A.S. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director, research in Busik/Proshlyakov labs is supported by NIH/NEI grant 2 R01 EY016077-08.

ALTERED INTESTINAL MUCUS PRODUCTION IN ESTROGEN DEFICIENCY IS ASSOCIATED WITH BONE LOSS
Daniel Schoenherr (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 161
Mentor(s): Fraser Collins (Physiology), Laura McCabe (Physiology), Sandi Raehtz (Physiology)

Menopause often leads to bone loss and osteoporosis, which is thought to occur from deficiencies in estrogen and progesterone that accompany menopause. Estrogen and the high molecular weight polymer MDY also change the physiology of intestinal health, which has downstream effects on bone density. To determine how estrogen interacts with the intestines, the ovaries were removed from mice to create an estrogen deficiency. The intestines from these mice were then analyzed and compared to control groups. A second study was then performed with intestinal goblet cells grown in vitro to determine the direct effects of MDY and estrogen on the cells. It was determined that cellular

proliferation, goblet cell differentiation, and mucus production decrease in the epithelium of the intestines in ovariectomized mice. These decreases are prevented or reversed with MDY treatment.

CYTOTOXIC T LYMPHOCYTE (CTL) THERAPY AGAINST PRE-ESTABLISHED TUMORS
Hyunji Shim (Michigan State University), Cassi LaRose (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 162
Mentor(s): Xuefei Huang (Chemistry), Shuyao Lang (Chemistry)

Cytotoxic T Lymphocytes (CTLs) can play critical roles in immunotherapy against solid tumors. One approach is to inject micro-particles enclosing Cytotoxic T Lymphocytes peptide epitopes (CTLp) to guide CTL to tumor sites. This method shows potential in the field of immunotherapy, however, CTL therapies have been compromised by, among other reasons, the inability to process antigens and to express major histocompatibility class I (MHC-I) properly by the tumor cells. To improve efficiency of immunotherapy, micro-particles were formed with Acetalated Dextran (ACE-Dex), a biocompatible polymer that is pH responsive. As opposed to the traditional encapsulation polymer, poly(lactic-co-glycolic acid) (PLGA), which is not pH-sensitive, ACE-Dex degrades more rapidly in the acidic intracellular microenvironment. CTLps are encapsulated by ACE-Dex-MPs for enhanced delivery to tumor cells. CTLps outcompete other endogenous epitopes, which leads to preferential CTL killing. The particles that were formed using ACE-Dex easily target tumor cells in the acidic environment due to the Enhanced Permeability and Retention effect (EPR). The functions of the resulting CTLp-ACE-Dex-MPs were investigated in vivo. Administrative doses of CTLp-ACE-Dex-MPs were given to groups of mice with pre-existing solid tumors, and it was concluded that the incorporation of micro-particles increased protection from death by tumor compared to the control group. Therefore, CTL therapy can be optimized by the use of micro-particles and lead to improvement in tumor protection.

A MACHINE-LEARNING APPROACH TO PREDICTING FUNCTIONAL GENIC REGIONS WITHIN THE ARABIDOPSIS THALIANA GENOME
Rosalie Sowers (Penn State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 163
Mentor(s): John Lloyd (Plant Biology), Shin-Han Shiu (Plant Biology)

A critical component of research in the post-genomic era is to elucidate the connection between genotype and phenotype. Although Arabidopsis thaliana serves as a model organism for plant biology and genetics, the functionality of much of its genome remains unknown. Characterization of sequence functionality through experimentation is often inefficient and/or inconclusive. Therefore, the development of a model that could predict functionality would enhance understanding of regions across the A. thaliana genome. We hypothesized that a machine-learning model trained on features ranging from sequence conservation to histone marks would be able to accurately predict the functionality across the A. thaliana genome by distinguishing between features of putative phenotype genes and pseudogenes. In order to develop this model, we processed sequencing data sets for histone marks, DNA methylation, chromatin accessibility, transcription factor binding, sequence conservation, and expression. We compared these processed data sets to well-annotated regions of the A. thaliana genome to calculate feature data for model building. Using random forest algorithms, subsets of the feature data were used to train our models. The performance of the models was evaluated using area under the curve-receiver operating characteristic (AUC-ROC). The best performing models were then applied across the entire genome to reinforce existing gene annotation, suggest that some gene regions may be non-functional, and identify potential novel genes of interest for further research.

COCAINE DEPENDENT INDUCTION OF FOSB GENE EXPRESSION IN MOUSE HIPPOCAMPAL SUBREGIONS
Audrey St. Germain (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 164
Mentor(s): Alfred AJ Robison (Physiology)

Drug addiction is characterized by the continued seeking and taking of drugs despite adverse consequences. The hippocampus, a brain region essential for learning and memory, has been implicated in this process, as the user typically makes associations between the drug and the environment in which they experience it. These long-lasting associations can contribute to craving and relapse even decades after abstinence. Thus, in order to better treat addiction and reoccurring relapse, we require a better understanding of the molecular underpinnings of these hippocampal memories. One candidate molecule in this process is the transcription factor ΔFosB, which is activated and builds up over chronic exposure to cocaine, and can influence gene expression for extended periods of time (as it has a half-life over 30 times longer than many similar transcription factors). ΔFosB has been found to be upregulated by drugs in other regions of the brain, including the Nucleus Accumbens (NAc), also known as the reward center, and its expression there is critical for cocaine-mediated behaviors in mouse models. The ventral hippocampus (vHipp) exerts top-down control over the NAc, and thus cocaine-dependent induction of ΔFosB in vHipp may also be critical for drug responses. To determine if ΔFosB is upregulated in the hippocampus, we treated mice chronically with cocaine in a novel environment and conducted immunohistochemistry to look for ΔFosB in the NAc and hippocampus. Determining the pattern of ΔFosB induction in vHipp will be an essential step for developing therapeutic interventions to addiction and other learning- and memory-related disorders.

FUNCTIONAL ANNOTATION OF CONSERVED NON-CODING SEQUENCES
James Stewart (St Edward's University)
Category & Time: Cell Biology, Genetics and Genomics, Section 7, 2:30 PM - 3:45 PM
Poster: 165
Mentor(s): Patrick Edger (Horticulture)

Conserved Non-Coding sequences(CNSs) are portions of the genome that do not encode for proteins but are conserved over deep time across angiosperms. Presently, it is hypothesized that these CNSs play an important role in regulating gene expression. The purpose of this project is to annotate these sequences, in the hopes of characterizing their function in the Arabidopsis thaliana (Brassicaceae) genome, using comparative functional genomic approaches. Duplicate genes from various duplication events within Arabidopsis were examined in order to determine if compositional differences of CNSs (overall abundance and localization) exist between duplicate genes retained following more recent tandem duplications and an ancient whole genome duplication unique to Brassicaceae. Significant differences in CNSs do exist between these two types of retained duplicate genes, and compared to conserved single-copy genes. Further CNS analyses will be conducted in order to annotate these sequences, with a focus on functions associated with primary and secondary metabolism.

CHARACTERIZATION OF A PROTEIN THAT CONTRIBUTES TO ER DYNAMICS
Nicole Szeluga (University of Maryland College Park)
Category & Time: Cell Biology, Genetics and Genomics, Section 8, 2:30 PM - 3:45 PM
Poster: 167
Mentor(s): Federica Brandizzi (Plant Biology), Pengfei Cao (Plant Biology)

Most plant products that make up many of the food protein, textiles, and biofuels that we use today are lipids, proteins, and sugars, which are synthesized or at least modified and secreted in the plant cell secretory pathway. The endoplasmic reticulum (ER) is the gateway to the secretory pathway. It is the most extensive compartment in the secretory pathway and is well connected with other organelles. The versatile functions of ER rely on its highly dynamic architecture. However so far less attention and research has been focused on the mechanisms of ER dynamics in plant cells. Unlike the well-studied mammalian cell with microtubules, plant cell ER movement mainly depends on actin cytoskeleton, and myosin motor proteins are the only known regulator. Recently we identified an ER-localized plant specific actin-binding protein, PFC1. Overexpression or depletion of this protein changes ER morphology and movement. In this study, we characterized actin-binding motifs using truncation, point-mutation, and subsequent confocal microscopy. To investigate potential regulatory mechanisms, point mutation was used for phosphorylation, and yeast two-hybrid assay and in vitro pull-down were performed for self-interaction and phosphorylation. In conclusion our work proposed a model that PFC1 enables ER movement by anchoring ER membrane to actin tracks.

EFFECTS OF CALCIUM CONCENTRATION ON PHENOTYPIC SWITCHING IN V. CHOLERAE
Naoto Tozaki (Portland State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 8, 2:30 PM - 3:45 PM
Poster: 168
Mentor(s): Yann Dufour (Microbiology), Han-Shin Kim (Microbiology)

Vibrio cholerae is a bacterium responsible for the infectious disease cholera. *V. cholerae* relies on biofilm formation in order to survive harsh conditions inside of the host and in the environment. The motile form of *V. cholerae* is also important during infection, as it is believed that motile cells travel to the host epithelial cells to deliver the cholera toxin. Calcium has been found to increase biofilm formation, but how motility and biofilm are regulated remains unknown. Here, we test the role of calcium concentration in regulating the transition between a biofilm and a motile life-style. We characterized *V. cholerae* phenotypes using swim-plate assays and microscopy analysis using *V. cholerae* wildtype and ΔvpsL mutant. Effects of calcium concentration on swimming behavior (motile and non-motile) were determined by single-cell tracking and computer analysis. We found that high calcium concentrations led to lower motility (μm/s) and low calcium concentrations led to higher motility. In calcium concentrations ranging from 100μM to 1mM, motile and non-motile populations co-existed. Calcium is known to effect expression of vibrio polysaccharide, a gene that is necessary for biofilm formation. We plan to analyze how calcium regulate VPS production via fluorescence analysis of single cells. Our results will help understand of how calcium can serve as an environmental cue to regulate the phenotypic response of *V. cholerae* during infection.

ANALYSIS OF MITOCHONDRIAL DYSFUNCTION IN DIABETIC RETINOPATHY
Tyler Wenger (Washington and Lee University)
Category & Time: Cell Biology, Genetics and Genomics, Section 8, 2:30 PM - 3:45 PM
Poster: 169
Mentor(s): Julia Busik (Physiology), Yan Levitsky (Physiology)

In the next twenty years, the worldwide prevalence of diabetes is estimated to increase by more than 55% according to the World Health Organization. Research into the intricacies of diabetic retinopathy is imperative, as it is currently the leading cause of blindness in adults. Mitochondrial dysfunction and oxidative stress are shown to cause retinal capillary cell apoptosis, however the specific mechanism of the diabetic mitochondrial dysfunction is as of yet to be discovered. Human Retinal Pigment Epithelial (RPE) cells treated with normal (5.5 mM) and high (25 mM) glucose conditions were used in the study. Mitochondria were isolated using differential centrifugation. Mitochondrial respiration was measured using OROBOROS respirometer approach and compared to NeoFox fluorometer oxygen probe with custom-designed microfluidic flat cell approach as well as a large volume cell approach. Four 15 cm plates (~700 cm^2) were used for each mitochondrial isolation to provide enough material for conventional large volume (2ml) NeoFox Oxygen consumption method. As the custom-made microfluidic flat cell allows for measurements in the total volume of 20ul, or 1/100 of the conventional method, we are confident that this approach will provide a more efficient approach for RPE mitochondrial analysis. Through respiratory analysis of the mitochondrial metabolic chain by using specific complex activators and inhibitors in cells grown in low and high glucose conditions, we can shine a light upon the root of mitochondrial dysfunction in RPE cells.

UPREGULATION OF LIVER X RECEPTOR IS A NOVEL THERAPEUTIC TARGET FOR DIABETIC RETINOPATHY PATHOLOGY
Kiana Wood (Michigan State University)

Category & Time: Cell Biology, Genetics and Genomics, Section 8, 2:30 PM - 3:45 PM
Poster: 170
Mentor(s): Julia Busik (Physiology), Sandra Hammer (Physiology), Elahe Crockett (Medicine)

Diabetic retinopathy (DR) is a sight threatening disease with limited treatment options. Several clinical trials have demonstrated significant role of dyslipidemia in the development of DR. Activation of the Liver X receptor α/β (LXRα/LXRβ) prevented diabetic retinopathy-induced pathology in animal model. LXRs are known to regulate cholesterol metabolism, as well as play a role suppression of inflammation. Moreover, SIRT1 has recently been shown to activate LXR in non-retinal systems but the role of the SIRT1-LXR signaling axis in the progression of DR has not been studied. Human retinal endothelial cells (HREC) were isolated from diabetic and non-diabetic patients. Bovine retinal endothelial cells (BREC) were treated with TNFα, and the role of SIRT1-LXR signaling axis was tested using SIRT1 activator SRT1720 and LXR activator DMHCA. LXRα /LXRβ, the ATP binding cassette transporters (ABCA1 and ABCG1) were analyzed using qRT-PCR. The db/db animal model was used to recapitulate diabetic retinopathy *in vivo*. HREC from diabetic patients showed a reduction in LXRα/LXRβ mRNA expression when compared to non-diabetic patients ($p<0.01$). SIRT1 mRNA levels were also decreased in diabetic patients when compared to controls ($p<0.05$). Furthermore, LXRα and ABCG1, were decreased in BREC when treated with TNFα ($p<0.05/p<0.01$, respectively). Treatment with activators prevented TNFα-induced ABCG1($p<0.0001$) and ABCA1($p<0.05$) downregulation respectively. Lastly, LXR activation *in vivo* blocked the development of acellular capillaries in diabetic mice. Diabetes-induced downregulation of LXR in the retina and activation of this nuclear receptor prevented diabetes-induced retinal pathology, suggesting that LXR activation could be used as a novel treatment for doctors. Support: K.W. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director, research in Busik lab is supported by NIH/NEI grant 2 R01 EY016077-08.

CHRONIC CADMIUM EXPOSURE AND MSC TOXICITY IN RATS
Devin Young (Michigan State University)
Category & Time: Cell Biology, Genetics and Genomics, Section 8, 2:30 PM - 3:45 PM
Poster: 171
Mentor(s): Kurt Hankenson (Small Animal Clinical Sciences/Physiology), Daniel Youngstrom (Small Animal Clinical Sciences)

Heavy metal toxicity is a worldwide public health concern. In this study, a cohort of rats was exposed to chronic, low-dose (30ppm) cadmium in their drinking water for two months, designed to mimic human industrial exposure. Markers of bone physiology and marrow stem cell health were evaluated using microtomography, in vitro cell culture, colorimetric assay and gene expression analysis. The results indicate that, while this level of cadmium exposure is not sufficient enough to alter bone structure, cadmium exposure affected stem cell yield, osteoblastogenesis and collagen production. These findings demonstrate a potential role for adult stem cell toxicity in the skeletal phenotype of cadmium exposure.

CHEMICAL ENGINEERING AND MATERIALS SCIENCE

CHARACTERIZATION OF CARBONOL-TERMINATED POLYDIMETHYLSILOXANE REACTION PRODUCTS BY AMINE AUTO-TITRATION
Nathaniel Arnold (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 175
Mentor(s): Hugh MacDowell (Chemical Engineering & Materials Science), Ramani Narayan (Chemical Engineering & Materials Science)

Titrations were used to find amine values of samples taken at specific points in time of a reaction between aminopropyl-terminated polydimethylsiloxane (APDMS) and propylene carbonate (PC) to form carbonol-terminated polydimethylsiloxane (OHPDMS). A graph of the amine values from the titration data can be created to show the change in the moles of amine present in the reaction as time progressed. Reactions were conducted at 70o C, 50o C, and 25o C with sampling of the reaction mixture every ten, twenty, and thirty minutes respectively. The milliliter amount of dilute hydrochloric acid (HCl) solution in isopropanol needed to neutralize the amine in a sample of the product was conducted using an Metrohm autotitrator. Amine value was calculated using the original weight of the sample, concentration of the HCl solution, milliliters of HCl solution used, and the molecular weight of potassium hydroxide. Three graphs were produced from the data points of each reaction by amine value versus time, showing a decrease in amine value as time progressed in the reaction. The titration data can be used to determine rate laws, Arrhenius equation, and activation energy by converting the amine value to moles of APDMS.

DESIGN OF BIO BASED FLEXIBLE POLYURETHANE FOAM FORMULATIONS WITH PETROLEUM BASED AND SILICON BASED POLYOLS
Nathaniel Arnold (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 176
Mentor(s): Hugh MacDowell (Chemical Engineering & Materials Science), Ramani Narayan (Chemical Engineering & Materials Science)

Foam formulations were made using a bio based polyol with a petroleum based polyol and a silicon based polyol. Bio based content was increased in the foams by adding increasing amounts of bio based polyol to petroleum based and silicon based foams. By adding several catalysts, including a gelling catalyst, crosslinking catalyst, and a blowing catalyst, along with a surfactant and a blowing agent, the combination of bio based and petroleum polyol or bio based and silicon polyol was reacted with isocyanate to form a partially bio based foam. Bio based polyol was added to the petroleum polyol in amounts 0%, 20%, and 50%. Bio based polyol was added to the silicon polyol in amounts of 0% and 50%. Free rise tests were performed to collect data on cream time, rise time, and tack-free time of the reaction. A box foam was created once a formulation met free rise profile criteria. By the end of the project, using the petroleum/bio based polyol, 0%, 20%, and 50% bio based foams were created. Using the bio based/silicon polyol, a 0%, 20%, and 50% bio based foam was created. The bio based/petroleum polyol foams were all within industry standards in terms of density.

THREE DIMENSIONAL CHARACTERIZATION OF TWIN STRUCTURE EVOLUTION IN PLASTICALLY DEFORMED TI ALLOYS
Jaswanth Bommidi (Indian Institute of Technology Madras)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 177
Mentor(s): Philip Eisenlohr (Chemical Engineering & Materials Science)

3-D characterization of twinning activity in deformed Ti-alloys is done using insitu X-ray microscopy and obtain the grain orientation mapping of the undeformed sample by point wise poking 45^{o} to top surface instead of line scanning. The grain structure is reconstructed using the poked points as seeds for Voronoi Tessellation. Serial Polishing and EBSD scan on the tensile deformed samples is done, followed by reconstruction of deformed microstructure by 3-D stacking of the EBSD scans and performing a Voronoi Tessellation on these stacked EBSD scans.

GREEN COMPOSITES BASED OF COTTON-GIN WASTE AND NANOCLAY
Juan Ignacio Caballero (Politecnical university of Madrid)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 178
Mentor(s): Mahmoodul Haq (Civil Engineering)

Disposal of cotton-gin waste, by product of the cotton industry, through incineration implies cost and environmental drawbacks. Another possible destination could be as reinforcement fibers for composites materials. For this purpose, cotton-gin waste composite plates will be manufactured with 4 different types of cotton-gin using compression molding and their mechanical properties will be characterized.

EFFECT OF RINSE WATER PH ON THE CORROSION PROTECTION OF TRIVALENT CHROMIUM PROCESS COATINGS ON ALUMINUM ALLOYS
Hector Colon (University of Puerto Rico at Mayaguez)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 179
Mentor(s): Greg Swain (Chemistry)

Conversion coatings are one component of a multi-layer coating system typically used to protect aerospace aluminum alloys from corrosion. Currently used conversion coatings contain hexavalent chromium so there is a need to replace these with more environmentally-friendly coatings. The trivalent chromium process (TCP) conversion coating is a potential alternate. The coating is formed on pretreated aluminum alloys by an immersion process. We investigated the effect of rinse water pH on the coating performance. Electrochemical methods were used to study the corrosion resistance TCP-coated AA7075-T6 in naturally-aerated 0.5 M Na_2SO_4 + 0.05 M NaCl at room temperature. After immersion, rinsings were performed in 0.01 M phosphate buffer solutions of pH 5 to 9. Electrochemical polarization results demonstrated that the pH 5 rinse suppresses anodic currents by 5x, whereas pH 6 through 9 rinses suppress anodic currents by 25-100x, as comparison to uncoated AA7075 controls. The rinsings at pH 6-9 suppressed anodic currents by greater levels that did a normal TCP coated alloy rinsed with city tap water. Scanning electron microscopy (SEM/EDXS) images provided an insight on the topography and surface chemistry changes resulting from the different pH rinsings. Salt spray and full immersion testing, both at 55 ^{o}C with 3.5% NaCl, were used to examine the corrosion protection of the TCP coating during environmental degradation testing. The ideal rinse water pH for the best corrosion inhibiting TCP coating on AA7075 was determined to be greater than pH 6, based on the results obtained from electrochemical characterization, microscopy, and environment degradation tests.

NANOFILRATION OF ENDOCRINE DISRUPTORS AND PHARMACEUTICAL COMPOUNDS WITH MODIFIED MEMBRANES.
Kevin J Cruz (Universidad de Puerto Rico - Arecibo)
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:15 PM
Poster: 180
Mentor(s): Alexandra Malin (Chemistry)

Water pollution is a common problem for humans and wild life. Although water treatment plants remove large particles and kill bacteria, they often fail to remove organic micropolutants like endocrine disrupting compounds (EDCs) and pharmaceutically active compounds (PhACs). Thus, these compounds may appear in trace amounts in in drinking water. This study examines removal of an EDC (Bisphenol-A(BPA)) and several PhACs (Acetaminophen, Amoxicillin and carbamazepine) via nanofiltration through commercial NF270 membranes as well as NF270 modified with up to six poly(allylamine hydrochlororide)/poly(sodium 4-styrenesulfonate) (PAH/PSS) bilayers. With the coated membranes, the average solute rejections were 91.4% for BPA, 39.5% for acetaminophen, 96.3% for amoxicillin and 97.0% for carbamazepine. Thus, the (PAH/PSS)6-coated NF270 removes more than 90% of all of the molecules except acetaminophen, which is both neutral and the smallest molecule we examined. Thus, the (PAH/PSS)6 coating increases rejection, but it also decreases membrane permeability, which will lead to higher energy requirements in nanofiltration. With sufficiently high rejections, in the future nanofiltration may serve as a final water purification step for removing organic micropolutants. The experimental set-up, the results of the filtration studies and the significance of the findings will be presented.

STUDY OF ELECTRON TRANSFER KINETICS AT OPTICALLY TRANSPARENT BORON-DOPED-DIAMOND/QUARTZ ELECTRODES
Monica Davis (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:15 PM
Poster: 183
Mentor(s): Kirti Bhardwaj (Chemical Engineering), Greg Swain (Chemistry)

Nanocrystalline diamond exhibits outstanding properties like stability, chemical inertness, low background current, a wide electrochemical window, and has optical transparency in a broad portion of the electromagnetic spectrum. Its conductivity can be easily increased by doping with boron atoms. These properties make boron-doped-diamond films deposited on quartz a promising material for optically transparent electrodes that have various practical applications in spectroelectrochemical measurements. In order to use these electrodes for developing sensors that utilize electrochemical and or spectroscopic detection modes, it is important to understand the factors that influence the rate and mechanism of electron transfer at these electrodes. This study investigates the influence of individual ions of electrolyte on the heterogeneous electron-transfer kinetics of the probe molecule, Ru(NH3)63+/2+ at reaction kinetics at boron-doped-diamond (BDD)/quartz electrodes. Effect of cation type is being studied using a set of electrolytes with same anion but different cation size and type (LiCl, NaCl, KCl and CsCl). Similarly, the anion type is being varied while keeping the cation the same (NaF, NaCl and NaBr). Reaction kinetics of the redox probe molecule are being studied using cyclic voltammetry. Anodic and cathodic currents are recorded at varying scan rates in the different electrolytes. Diffusion coefficients and peak potential separations are being compared. We hypothesize that changing the cation type should have little effect on the redox activity response of Ru(NH3)63+/2+ while changing anion should have larger effect.

THE EFFECT OF CATALYST ON THE REACTION KINETICS OF DIMETHYL CARBONATE PRODUCTION
Vincent DiGiorgio (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:15 PM
Poster: 184
Mentor(s): Dennis Miller (Chemical Engineering & Material Sciences), Scott Parker (Chemical Engineering & Material Sciences), Lars Peereboom (Chemical Engineering & Material Sciences)

Dimethyl Carbonate (DMC) is a popular compound with a variety of uses. Globally, DMC is used as a solvent, fuel additive, and an electrolyte for batteries. The original process of DMC production involves toxic phosgenes, and contributes a large carbon footprint. This project aims to produce DMC through a “greener” method. Using a different reaction process, DMC can be produced in a more sustainable way. For this cleaner reaction, it must be determined the effect that the catalyst has on the reaction rate. The catalyst was used for multiple trials of the reaction, altering the parameters, to observe the effects. These trials aim to determine the reaction kinetics, reactive sites, and long term stability of the catalyst. Reactions were run in a round bottom flask, under a heating mantle, and operated at reflux temperature; different catalyst weight percentages, and the catalyst reuse, was altered to observe the reaction rates. Catalyst loading was varied at 1wt%, 3wt%, and 5wt%, and one trial was run with catalyst for a second use. Liquid samples were taken every 15 to 30 minutes to be analyzed in the gas chromatographer and determine the concentration of each chemical in the solution. It was found that there is a slight dependence on catalyst loading to reaction rate; the rate appeared to increase as the catalyst weight percent was increased. Second, when the catalyst was reused for a reaction, an increase in reaction rate was observed.

SYNTHESIS AND SEPARATION OF VARIOUS CIS AND TRANS DOUBLE DECKER SILSESQUIOXANES
Parker Dunk (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:15 PM
Poster: 185
Mentor(s): Dr Andre Lee (Chemical Engineering & Material Science)

Various methods were used to synthesize and vary the R groups of double-decker silsesquioxanes (DDSQs). The objective of changing the R groups of the silicon cages is to adjust the parameters of the material to made it more suitable for use in high temperature applications. DDSQ nanoparticles were chosen as the material of interest due to their ability to be incorporated into polymeric materials. In addition to the synthesis of DDSQs, there are other challenges of being able to precisely separate *cis* and *trans* isomers. On a laboratory scale, silica gel is a sufficient separation method. As we begin to look at large scale production other methods such as fractional crystallization will be considered. Further exploration of separation of DDSQs molecules will include addition of two separate R groups to be able to create an A-B *cis* and *trans* isomer instead of only the A cis and trans isomers.

CR(VI) DETECTION IN NON-CHROMATE PRETREATMENTS FOR ALUMINUM ALLOYS
Rodolfo Estrada (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:15 PM
Poster: 186
Mentor(s): Greg Swain (Chemistry)

Chromium in the hexavalent state (Cr (VI)) is a powerful corrosion inhibitor and is widely used in pre-treatment conversion coatings and primers to protect aerospace aluminium alloys from corrosion. Due to the highly toxic and carcinogenic nature of Cr(VI), there is a worldwide effort to identify suitable replacement coating systems. Effective replacements are the trivalent-chromium based coatings.This study explores the mechanism behind corrosion protection of Trivalent Chromium Process (TCP) coatings, specifically, we seek to learn if there is any transient formation of Cr(VI) in TCP coatings and if any of the coating elements leach into a contacting aqueous layer.

CHARACTERISTICS OF MORPHOLOGICAL FRACTIONS OF PANACIUM VIRGATIUM AND RESPONSE TO CHEMICAL PRETREATMENT
Georginelly Ferreira Inacio (Federal University of Ceara)
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:15 PM
Poster: 187
Mentor(s): David Hodge (Chemical Engineering & Materials Science)

Lignocellulosic biomass is a promising feedstock for the production of fuels and chemicals to displace traditional petroleum derived products. Representing the largest source of terrestrial carbon, lignocellulosic biomass has the potential to displace a significant fraction of transportation fuels and chemical needs if utilized optimally; however, more work is needed to understand the diverse composition and characteristics of feedstocks contributing to recalcitrance. Current research endeavors utilize chemical pretreatment followed by enzyme assisted sugar depolymerization to alter biomass characteristics and reduce recalcitrance to generate sugars for fermentation processes. Prior literature has shown that different developmental stages of plant tissues demonstrate a wide range of compositional characteristics. It is therefore hypothesized that morphological fractions from different developmental stages, as well as tissue type will respond non-uniformly to chemical pretreatment. The objective of this study was to investigate the role of tissue specific developmental stages of three different tissues of *Panacium virgatium* on biomass composition, response to chemical pretreatment, and subsequent enzymatic hydrolysis. Initial tissue compositions were determined and compared, with subsequent evaluation of tissue response to pretreatment through compositional change. Pretreatment conditions were determined and evaluated using a two-factor design of experiments, varying temperature and reaction time. Response variables included compositional change, as well as enzymatic digestibility and water retention. Enzymatic digestibility was utilized to directly determine the amount of fermentable sugars generated from specific tissues while water was utilized as an indirect metric to measure tissue swellability and change in cell wall recalcitrance.

INK-JET PRINTED SENSORS FOR SMART BANDAGES
Margaret Gajda (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 190
Mentor(s): Romana Jarosova (Chemistry), Greg Swain (Chemistry)

There is value in developing a “smart bandage” capable of monitoring a chronic wound and reporting on the status of wound healing. Such a bandage could electrochemically transmit valuable data such as oxygen level, pH, and the presence of certain toxins produced by bacteria, such as pyocyanin. Such a bandage would allow for individualized care based on clinically relevant data. The electrodes present in the bandage should be accurate, low cost, and disposable to allow for effective wound management. Ink-jet printing technology is being employed to provide a cost-effective and reproducible way to manufacture carbon nanotube ink electrodes. This study is investigating the stability of these electrodes in a phosphate buffer and a “wound” solution mimic. The stability of the materials used to form the electrode and the electrochemical response for pyocyanin are being evaluated at room temperature and 37°C. Ideally, the “smart bandages” should last seven days for both cost efficiency and the patient’s comfort. In this presentation, we will report on the physical stability of the electrode and the stability of the electrochemical response for pyocyanin over a 7-day period of exposure. Additionally, we will report on the detection figures of merit for pyocyanin in the wound fluid mimic.

SUCCINATE BASED PLASTICIZERS: A GREEN SOLUTION
Evan Hendrix (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 191
Mentor(s): Dennis Miller (Chemical Engineering & Materials Science), Lars Peereboom (Chemical Engineering & Materials Science)

Currently plasticizers are phthalate based and are produced in batch reactors. Phthalate based plasticizers can be found in the environment, can accumulate in the tissue of mammals after leaching out of PVC products, and will eventually degrade into more toxic compounds. Being produced in batch reactors also creates problems such as needing post-treatment by distillation and loss of catalyst. The goal of this project is to create a green, succinate based plasticizer through reactive distillation methods. The early phases of the project involve solubility tests and experiments for reaction kinetics. The solubility tests are performed in the presence of reactants and the intermediate ester at different temperatures and concentrations to find the optimal conditions for maximum solubility of the succinic acid (SA). Other methods are tested for the transfer of succinic acid into the reactive mixture such as testing the solubility of water in the alcohol. Once the solubility of SA has been addressed the reaction kinetics are tested by running the reaction and using the concentrations or molar percentages to find the constants of the reaction. The results of this project depend highly upon the solubility of SA in the reaction mixture. To date, we have found that SA will dissolve in the pure alcohol up to around 7 weight percent around 95 – 97 degrees Celsius.

WATER-SOLUBLE SILICON QUANTUM DOTS FOR PHOTOCATALYTIC WATER-SPLITTING
Aaleyah Joe (Mary Baldwin College)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 192
Mentor(s): Remi Beaulac (Chemistry), Mersedeh Saniepay (Chemistry)

Current fuel sources involve burning hydrocarbons, which are raw materials we cannot afford to waste. From an environmental sustainability perspective, the rapid depletion of costly nonrenewable fuels is driving research on alternative sources of energy, such as hydrogen fuel production. Photocatalytic water-splitting is a carbon neutral approach to this issue because it requires only water, photons, and a catalyst to produce hydrogen fuel. Water splitting is an artificial photosynthetic process that is inexpensive and produces clean renewable energy (H_2) without the production of harmful greenhouse gases that current oil and nonrenewable fuels produce. In the present work, we researched a green chemistry approach to the synthesis of water-soluble silicon quantum dots that could potentially be coupled with a catalyst to facilitate water-splitting. The challenges to overcome include functionalizing the silicon quantum dots with a water-soluble ligand and finding ways to make the particles stable in water. In experiments, hydrogen-terminated silicon quantum dots (5 nm diam.) obtained from a plasma reactor were functionalized with a water-soluble ligand. We studied the surface chemistry of the modified silicon quantum dots using nuclear magnetic

resonance spectroscopy (NMR), transmission electron microscopy (TEM), and x-ray powder diffraction (XRD). The stability of the silicon quantum dots in water was evaluated using ultraviolet-visible spectroscopy and through measurements of the quantum yield. Understanding the fundamental processes that enable Si quantum dot stability in water would help enable the proposed solar-to-hydrogen fuel pathway, which has potential to decrease the substantial amount of precious raw materials we waste each year.

DETERMINATION OF ACID VALUE, AMINE VALUE AND HYDROXYL VALUE OF POLYOLS USING POTENTIOMETRIC TITRATION METHODS
Sara Kolar (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 193
Mentor(s): Sayli Bote (Chemical Engineering & Materials Science), Ramani Narayan (Chemical Engineering & Materials Science)

The titration is a method that can be used for quantitative determination of functional groups like carboxyl groups or hydroxyl groups present in materials like polyol. Polyol is a material containing multiple hydroxyl groups. The hydroxyl value is measured as the milligrams of potassium hydroxide equivalent to the hydroxyl content in one gram of the material tested. A hydroxyl value is significant as it is used in the synthesis of polyurethanes where polyols are reacted with isocyanates. The p-toluenesulfonyl isocyanate titration method was chosen to find hydroxyl values, since it is pyridine free, quick and accurate. This method involves reacting the hydroxyl groups with an excess of p-toluenesulfonyl isocyanate to form acid carbamate. The acid carbamate is then titrated with tetrabutylammonium hydroxide as the titrant. This method requires the polyol to be neutral, otherwise the acidity or alkalinity of the polyol must be determined to correct its hydroxyl value. If carboxyl groups are present in a material, then it will contribute to its acidity which can be determined by an acid value titration. Amines are basic in nature which causes an increase in alkalinity, so an amine value titration is required. To find the amine value, the material is titrated with hydrochloric acid until alkyl ammonium salts are formed. The acid value is found by titrating with a basic titrant until neutralization is reached. The potentiometric titration method is quick and accurate thus it will be used to determine the hydroxyl value, acid value and amine value of polyols.

BUILDING A CHEMICAL ENGINEERING PLAYGROUND
Yu-Ting Lin (Michigan State University), Lihan Zhu (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 194
Mentor(s): Daina Briedis (Chemical Engineering & Materials Science), Maddalena Fanelli (Chemical Engineering & Materials Science)

The current project focuses on designing and building a chemical engineering playground, a set of simple, small-scale and safe experiments to give students and the community at large an understanding of chemical engineering principles in a fun and convenient way. The objective for this work is to research and develop fluid flow and liquid-liquid extraction experiments. For the fluid flow experiment, a peristaltic pump and two vessels are connected by transparent and flexible plastic tubing. The tube size is varied to investigate the effects of length and inner diameter on pressure drop. The experimental pressure drop results are compared with theoretical and literature predictions. For the liquid-liquid extraction experiment, water and soybean oil are used as solvents. Preliminary research involves finding an appropriate color pigment whose mass transfer from one phase to the other can be gauged visually and quantified with a spectrophotometer. Research focuses on finding and testing a food colorant that is soluble in both oil and water and assembling a simple, small scale continuous flow experiment.

MODIFICATION OF ALUMINUM SILICON MICROSTRUCTURE AND PROPERTIES
Camilla McCormack (University of Kentucky)
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:30 PM - 3:45 PM
Poster: 195
Mentor(s): Andre Lee (Chemical & Materials Engineering), Yang Lu (Chemical & Materials Engineering)

Currently cars and trucks are primarily composed of steel, which is heavy and prone to rust but is also very strong. In order to make cars more efficient, a lighter but just as strong material is needed, namely an aluminum silicon alloy. By using a hypereutectic aluminum-silicon alloy that has been modified using Trisilanol-Phenyl POSS (TSP), we can make an alloy that is more ductile while maintaining a high strength via grain modification. This is done by adding the TSP in different ways and amounts, making alloys with various silicon percentages, and using various casting techniques in order to get finer silicon grains throughout the aluminum matrix. Since silicon is much stronger than aluminum, a hypereutectic alloy would be most beneficial if the ductility of the alloy could be increased, as silicon is very brittle. The TSP is dissolved in the molten alloy via puck, where the TSP powder is combined with A4047 powder then pressed to form the cylindrical puck, or soaking the chips in a solution of TSP and ethanol before melting. The TSP has been shown to refine the eutectic silicon grains, making them smaller and more difficult to break under stress, such that the strong but brittle hypereutectic aluminum silicon becomes more ductile. However, the TSP has also been shown to produce slag that, at higher amounts of TSP, does not entirely dissolve during the casting process. In addition, the TSP causes some modification of the primary silicon phase, leading to an overall weaker material.

SUBSTRATE CHANNELING BY ELECTROSTATIC GUIDANCE
Akhilesh Paspureddi (Indian Institute of Technology Madras)
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 198
Mentor(s): Scott Calabrese Barton (Chemical Engineering & Materials Science)

Nature has always been the most inspiring medium for the development of science. One such inspiration in the field of synthetic chemistry is the phenomenon of substrate channeling - in which reaction intermediates are transported between reaction sites without transport into the bulk phase. This phenomenon can be effectively used in multistep catalysis to increase reaction rates. Mechanisms of substrate channeling have been rigorously studied over past century,including common mechanisms such as electrostatic guidance and steric confinement, etc. In this work we analyze the effect of changing the diffusion coefficient of the bulk phase towards the transport characteristics of a charged intermediate controlled by electrostatic interaction with oppositely-charged polypeptide chains. Molecular dynamics simulation enables the study of such interactions, which are difficult to study experimentally. Here we show that in cases where substrate channeling occurs, the bulk diffusivity of the intermediate does not correlate to local diffusivity.

COMBINATION OF HYDROLYSIS AND BIODEGRADATION FOR TREATMENT OF POLYETHYLENE TEREPHTHALATE (PET) WASTE

Shrirang Sabde (Institute of Chemical Technology)

Category & Time: Chemical Engineering and Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 199
Mentor(s): Ramani Narayan (Chemical Engineering & Materials Science), G D Yadav (Chemical Engineering & Materials Science)

End of life of a polymer is very important whether it is recycling or degradation. Hydrolysis, methanolysis and glycolysis are some of the methods which are used for recycling of polymers. They are based on depolymerisation of polymer through solvolytic chain cleavage into low molecular weight product for further application. Polymers like PET are successfully converted into low molecular weight oligomers or monomers using hydrolysis with catalyst at various pressures and temperatures in short duration of time. However, they are economically and environmentally non-viable which limits application of these techniques on practical scale consequence of this, result into no treatment of polymer waste. In this current work, polyethylene terephthalate (PET) waste will be hydrolysed into low molecular weight oligomers using hydrolysis in presence of catalyst at comparatively low pressure and temperature. The oligomers will be characterized for acid value and hydroxyl value to study kinetics of hydrolysis reaction. Thermal analysis of oligomers will be performed using thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). Then these oligomers can be further treated with aquatic biodegradation where microorganisms will convert hydrocarbons to carbon dioxide and water. Thus, objective of this work is to completely biodegrade PET waste using combination of hydrolysis and biodegradation.

ELECTROCHEMICAL DETECTION OF ISATIN USING FLOW INJECTION ANALYSIS WITH AMPEROMETRIC DETECTION.

Simon Sanchez (St. Mary's University)

Category & Time: Chemical Engineering and Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 200
Mentor(s): Romana Jarosova (Chemistry), Greg Swain (Chemistry)

Isatin is a heterocyclic compound that has been shown to have a wide range of biological activities. Isatin is found endogenously in humans and rodents. In rat models, isatin concentrations have been shown to increase with stress in the heart, brain, blood plasma, and urinary samples. In the rat, highest concentrations are in the vas deferens and seminal vesicles with levels in the heart somewhat higher than in the brain. The highest concentrations in the brain are found in the hippocampus and cerebellum. Isatin is electrochemically active and can be detected with electrochemical techniques. Of these techniques, flow injection analysis is a versatile technique used for the determination of easily oxidizable or reducible analytes. The performance of a nitrogen-incorporated tetrahedral amorphous carbon electrode and a boron-doped diamond electrode was evaluated using flow injection analysis with amperometric detection. The boron-doped diamond electrode is known for its excellent properties such as a low stable background current, weak molecular absorption, and microstructural stability, but has a high deposition temperature required for growth, (600-800 C). Similarly, the ta-C:N electrode has been shown to exhibit many of the same attractive properties of the boron-doped diamond electrode such as a low background current, microstructural stability, and weak molecular absorption with the advantage of a low deposition temperature near room temperature (25-100 C). The analytical detection figures of merit such as the response precision, sensitivity, linear dynamic range and limit of detection for isatin in a 0.1 M phosphate buffer (pH 7.2) were determined for both electrodes.

INTEGRATION OF ALKALINE PRETREATMENT OF BIOMASS IN A COUNTERCURRENT EXTRACTION FOR BIOFUEL PRODUCTION

Angel Noel Santiago Colon (Universidad de Puerto Rico - Recinto de Mayaguez)

Category & Time: Chemical Engineering and Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 201
Mentor(s): David Hodge (Chemical Engineering & Materials Science)

With the raising concern for the availability of fossil fuel supplies and drastic climatic changes caused by greenhouse gas emissions it is imperative to search for novel renewable energy to look for new energy renewable sources. Currently, there are major efforts to convert traditional transportation fuels to biofuels such as ethanol. However, this has not been enough to satisfy the fuel quantity demanded by society. The engineering community is trying to develop a viable route to obtain ethanol from lignocellulosic biomass such as sweet sorghum. Before any operational industrial process can be employed, an effective pretreatment step must be developed to break down the biomass structure and make it more accessible to enzymes; obtaining a higher yield of glucose and consequently ethanol. This work focuses on the implementation of an alkaline pretreatment in a countercurrent sugar extraction. A sorghum bioenergy hybrid (TX08001) was submitted to a process of six stages of soluble sugar extraction with water, and sodium hydroxide (NaOH) to pre-treat the biomass and obtain a higher level of glucose. Expected results are to observe a higher yield of glucose after including alkaline pretreatment in the countercurrent process in comparison to yields obtained in the procedure where these two stages are performed separately. This approach offers the advantage of a continuous process which could be extremely beneficial to industry as it would lower production costs. It is important to find the optimal operational conditions in order to increase biofuel production and satisfy society energetic demands.

SYNTHESIS OF DIMETHYL CARBONATE FROM ETHYLENE CARBONATE AND METHANOL USING AMBERLYST A21 AS CATALYST
Joseph Thompson (Michigan State University), Vince Digiorgio (Michigan State University)
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 202
Mentor(s): Dennis Miller (Chemical Engineering), Scott Parker (Chemical Engineering), Lars Peereboom (Chemical Engineering)

The reaction of methanol (MeOH) with ethylene carbonate (EC) produces dimethyl carbonate (DMC) which is a useful solvent, gasoline octane enhancer and methylating agent. Detailed study of the reaction mechanism was performed to understand the steps involved in the conversion process. A 70 ml batch reactor fed with a known mole ratio of MeOH:EC and equipped with a stirrer is used to characterize the amberlyst A21 catalyst. Temperature and pressure are monitored, and samples are periodically collected over the reaction period. Gas chromatography technique is used to analyze the samples to determine the compounds present and their relative compositions. Several experiments will be performed to understand the kinetics of the reaction and to determine the optimum operating conditions. Once successful, the batch reactor experiments will be replicated in a pilot plant where DMC will be produced in a large scale. The success of the research will curtail CO2 emission to the atmosphere and address the critical issue of climate change.

THE SYNTHESIS OF HA-CONJUGATED NANOWORMS FOR TARGET AND DETECTION OF TUMOR AND CANCER CELLS
Anthony Smith (Northeastern Illinois University)
Category & Time: Chemical Engineering & Materials Science, Section 4, 2:30 PM - 3:45 PM
Poster: 203
Mentor(s): Xuefei Huang (Chemistry), Seyedmehdi Nasr (Chemistry)

The emergence of dextran-coated magnetic iron oxide nanoworms (NWs) has gained much interest as tools to target tumor and cancer cells for detection. NWs provide a biocompatible motif for conjugating a combination of targeting ligands and/or anti-cancer therapeutics. The morphology and size of NWs produce a large saturation magnetization value which enhances T2 relaxivity of protons in water molecules thereby increasing magnetic resonance imaging (MRI) sensitivity. Hyaluronic-acid (HA), a type of glycosaminoglycan (GAG), was conjugated to NWs yielding HA-NWs. HA was selected as a targeting molecule due to its high affinity toward CD44 receptor which is over-expressed and activated on the surface of tumor and cancer cells in contrast to normal cells. This HA-CD44, ligand-receptor, interaction along with the distinct over-expression of the CD-44 receptor are features that this investigation utilizes for targeted detection. The physical and electrical properties of NWs were characterized using dynamic light scattering (DLS) and gel electrophoresis. Cell lines used during this investigation in-vitro are human ovarian carcinoma cells (SKOV-3) and two types of head and neck squamous carcinoma cell lines (HNSCC), UT-SCC-14 (radiosensitive) and UT-SCC-15 (radioresistant). Interactions between HA-NWs and cells were studied by measuring iron amount using inductively coupled plasma analysis (ICP). I expect that the HA-NWs will have a higher efficiency over dextran-coated iron oxide nanospheres (SPIONs) at targeting CD-44 expressing cancer cells in this experiment.

CIVIL AND ENVIRONMENTAL ENGINEERING

LOW COST WATER MONITORING WITH A CELL PHONE CAMERA AND A JEWELER'S LOUPE
Selett Allen (Michigan State University), Zoe Wilton (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 206
Mentor(s): Rebecca Lahr (Lyman Briggs/Civil & Environmental Engineering)

The cost for an individual tap water test for one contaminant can range from $12 to $125 from the Michigan Department of Environmental Quality (DEQ). This cost is above what many Michigan households can afford, especially lower income households. Consequently, there is a need for user friendly, cost-efficient, low tech, and reliable methods for monitoring contaminants in tap water. Nanochromatography and the “coffee ring” effect have proven useful for separation of aqueous solutions before analysis with Raman spectroscopy (cyanotoxins, human tears, knee fluid), but the residue patterns alone have not yet been harnessed for tap water monitoring. The coffee ring effect separates solutes in water droplets during water evaporation based on size and solubility, causing each water sample to leave a distinguishable residue pattern based on the identities and concentrations solutes present. In this work, droplets of tap water and synthetic hard water solutions were dried on various substrates, several jeweler’s loupes were tested to examine how well they magnified the sample, and a cell phone camera was used to capture images. Aluminum foil and a 30x triplet loupe with an LED light and clear plastic stand produced optimal images of residues. Tap water and synthetic hard water samples each produced distinct residue patterns.

IMPACT OF SURFACE DISCONTINUITIES ON PAVEMENT DAMAGE DUE TO WATER INFILTRATION
Xiaoyu Chen (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 207
Mentor(s): Gopi Musunuru (Civil Engineering)

The moisture content in pavement sublayers can be affected by many factors including surface discontinuities such as cracks and unsealed joints. The surface discontinuity allows water to infiltrate into pavement sublayers, which would affect sublayer properties such as Resilient Modulus (MR). The change in MR of the sublayer leads to change in pavement performance in terms of cracking. Seasonal Monitoring Program (SMP) study in the Long Term Pavement Performance (LTPP) program provides valuable information for sublayer moisture and temperature, precipitation, traffic, etc. for 32 sections located in different regions in the United States and Canada. The goal of this project is to relate moisture content of pavement sublayers with the surface discontinuities under different climate conditions by using the LTPP data. The relationship developed can be used for predicting the MR of the sublayer. The result of this project would be beneficial for predicting the optimum time at which actions such as sealing the joints should be taken in order to obtain expected pavement performance.

SIMULATION AND ANALYSIS OF QUARTER, HALF AND FULL CAR MODEL FOR VARIOUS DESIGNED ROAD PROFILE ON AN ANALYTICALLY SIMULINK MODEL
Charlotte Fung (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 208
Mentor(s): Imen Zaabar (Civil & Environmental Engineering)

Vehicle operation and highway maintenance is essential to sound planning and management of highway investments, especially when it is under an increase of infrastructure demands and the declining of budget resources. Pavement preservation has recently gained a wide acceptance among different highway agencies because of the cost effectiveness and the ability to enhance the pavement performance and reduce the environmental impacts. The pavement characteristics influencing rolling resistance and vehicle fuel economy includes roughness, texture and structural response. This project mainly focuses on investigating the increase in vehicle energy consumption due to pavement structural response which is caused by the increase in roughness induced dynamic loading. By using MatLab/Simulink software, three different models were made for quarter-car, half-car and whole car model to determine the motion of vehicles while driving on different pavement profile. On the other hand, to determine the effect of roughness features on vehicle durability, different road profiles were developed to conduct the fatigue damage of a vehicle response.

EMISSION MINIMIZATION CONSIDERING USERS TRAVEL PATTERNS AND MODE CHOICE
Manoj Gedela (Indian Institute of Technology Madras), Fernanda Jeffers (University of California Irvine)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 209
Mentor(s): Mehrnaz Ghamami (Civil & Environmental Engineering)

Transportation accounts for over 60% of all petroleum consumed in the US, of which 60% must be imported. Together, the transportation sector is responsible for roughly 27 percent of the total GHG emissions in the U.S. The objective of this project is to create a model to minimize the emissions produced by the transportation sector in different communities. These communities, including different countries, states or cities, have different travel distance distributions, which affects the mode choice of the users. Therefore, as the first step, daily travel distance distributions are plotted for various cities in the US and also for different countries across the world using the census data and the Household travel surveys. The travel distance distribution plots report the daily miles traveled by each portion of the population. As the next step, current percent of users using each mode of transportation within these communities is found. The current mode share will later be used for the comparison purposes. After observing the current travel patterns, the wells-to-wheels emission for various modes is studied. The wells-to-wheels emission is affected by the source of energy, which varies between different communities. For example, electric vehicles in areas where electricity is produced by nuclear sources are cleaner modes of transportation than electric vehicles in areas where electricity is produced by burning coal. These wells-to-wheels unit emission produced will later be used in the model to minimize the emission by using optimization techniques and promoting certain modes of transportation.

EFFECTS OF USERS TRAVEL PATTERNS ON MODE CHOICE AND EMISSION PRODUCTION: SENSITIVITY ANALYSIS ON VARIOUS COSTS
Fernanda Jeffers (University of California, Irvine), Manoj Gedela (Indian Institute of Technology Madras),
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 210
Mentor(s): Mehrnaz Ghamami (Civil & Environmental Engineering)

One of the major sources of greenhouse gas emission is the transportation sector. Population growth, migration to the develop cities, increase of income and the industry of vehicles manufacturing more affordable vehicles trigger the growth in the demand for transportation sector. Thus, it is important to rethink ways to develop sustainability in the transportation sector. Private vehicles contribute to most of the trips not only in the United States but also in the world, and the industry is still highly dependent on fossil fuels. However, travelers can choose different types of vehicles and different modes of transportation, considering their travel pattern. This mode and vehicle choice affects the emission production. The objective of this study is to minimize emission under various cost scenarios. This will be done using a mathematical model along with thorough sensitivity analysis.

MEASUREMENT OF STRAINS IN THIN BONDLINE OF JOINTS USING FBG ROSETTES
Neha Joshi (National Institute of Technology Karnataka - Surathkal)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 211
Mentor(s): Mahmoodul Haq (Civil & Environmental Engineering)

There has been a tremendous increase in the use of adhesively bonded joints in the automotive applications as they show excellent fatigue properties, reduce weight and stress concentration and eliminate holes. Due to the thickness limitation, strain gauge rosettes which are generally used in experimental mechanics to measure the stress-strain in the principal directions have been found unsuitable as they introduce flaws within and hinders the performance of the thin bondline joints. Fiber Bragg Grating (FBG) optical sensors, due to its small size can be one solution to the problem with numerous other advantages over the conventional electrical sensors such as fatigue durability and multiplexing. The purpose of this study is to evaluate the feasibility of application of FBGs in a rosette configuration. Four FBG sensors is suggested where the three FBG sensors will be kept in a delta configuration and the fourth sensor will be used to check its validity and the data obtained. Strain data will be measured and calculated using a Micron Optics SM125 Interrogator and numerical models will also developed to compare and analyze the results obtained from the experimental studies.

TIO2-MEDIATED PHOTOCATALYSIS FOR WASTEWATER DISINFECTION: EFFECT OF DISSOLVED ORGANICS
Caroline LaRoy (St. Olaf College)
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 212

Mentor(s): Stephanie Roualdes (Materials Science), Samuel Snow (Civil & Environmental Engineering), Volodymyr Tarabara (Civil & Environmental Engineering)

The use of photocatalysis for water purification has been investigated for many years. Photocatalysis has significant promise as an alternative method of water disinfection. However, dissolved compounds present in wastewater, including natural organic matter (NOM), pose a challenge. NOM can interfere with the degradation of target pollutants by consuming reactive oxygen species generated by the photocatalyst, thereby reducing the availability of these oxidants for inactivating pathogenic microorganisms. In this project, we will employ a two-pronged strategy. First, we will characterize the NOM in the effluent from three wastewater treatment plants and investigate the efficiency of TiO_2 mediated photocatalysis by measuring the degradation rate of a probe compound – para-chlorobenzoic acid (pCBA) – in a batch reactor. pCBA has a known reaction rate with OH radicals, and can therefore be used to measure reaction kinetics. We expect to show the dependence of the pCBA degradation rate on the concentration of quenching agents, like NOM, and determine the dependence of pCBA degradation on different types of NOM. Second, we will immobilize TiO_2 on the permeate surface of an inorganic membrane and evaluate photocatalysis in a flow-through system where the UV light is applied to the membrane permeate. We expect that NOM removal by the membrane will facilitate photocatalysis.

IMPACT OF PAVEMENT STRUCTURAL RESPONSE ON ROLLING RESISTANCE AND VEHICLE FUEL ECONOMY
Jared Linze (Southern Illinois University Carbondale)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 215
Mentor(s): Imen Zaabar (Civil Engineering)

The major significance of this research project stems from the desire to reduce the fuel consumption of vehicles that is caused by the rolling resistance on the highway pavement. Analysis of the effects of the rolling resistance requires consideration of the entire system: pavement, foundation, road geometry, vehicles, and climate. The main pavement characteristics that will affect the rolling resistance of the vehicle are the surface roughness and structural response. This research project aims to investigate the change in vehicular energy consumption that comes from a changing structural response of the pavement. It has been proven that this energy consumption is equal to the energy dissipated through the pavement, caused by the deformation of the pavement under vehicular load and including the delayed deformation of the viscoelastic material and the other damping effects of the pavement and subgrade which also consume energy. This energy consumption has been characterized as the energy required for a wheel to roll uphill. It faces positive slope that is formed by a local deflection basin caused by the delated deflection of the viscoelastic pavement. The structural response of the pavement to the loads from moving vehicles was calculated for both concrete and asphalt pavements under different vehicle loads and speeds and pavement temperatures. Energy dissipation and excess fuel consumption were compared for the two different pavement types.

CHARACTERIZATION THE MECHANICAL PROPERTIES OF CONCRETE
Mara Elisa Ramos-Seplveda (University of Puerto Rico Mayagez)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 216
Mentor(s): Pratik Bhatt (Civil Engineering)

Concrete is a widely used construction material owing to its numerous advantages. Traditionally, concrete is a mixture of cement, aggregates (coarse and fine) and water, however, nowadays various chemicals known as admixtures are also added to improve its properties. Is essential to characterize these new mixtures and evaluate how its mechanical properties differ from the traditional concrete. These mechanical properties improve with curing time due to rapid hydration of cementitious materials. The effect of curing time (age) on mechanical properties of new concrete types is not well emphasized in literature. This data, effect of age in mechanical properties of concrete, is critical for designing structures in new concrete types. In present study, the progression of compressive and tensile strength as well as the density of concrete is evaluated at 7, 14, 28, 90 and 365 days from the casting of concrete. These compressive and tensile strength is evaluated by testing cylinder specimens in accordance with the specifications provided in ASTM C39 and C496. The batch mix proportions, of concrete, were intended to achieve a target compressive strength of 4000psi at 28 days. Nevertheless, the compressive and tensile strength of concrete cylinders observed at the end of 7 days was 4900 psi and 400 psi, respectively. This indicates there is rapid strength gain in concrete due to the presence of admixtures. From this study it can be concluded that addition of admixtures accelerated the hydration process which lead to rapid strength gain in concrete.

LIFE CYCLE ASSESSMENT OF SECOND LIFE BATTERY FROM EV APPLICATIONS TO PHOTOVOLTAIC APPLICATIONS
Kelsey Goss (Michigan State University), Urusha Regmi (National Institute of Technology Karnataka)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 217
Mentor(s): Annick Anctil (Civil & Environmental Engineering)

In this report, we evaluated the capacity and performance of automotive batteries in secondary PV applications after they have partially degraded to around 80% of their original capacity and are no longer serviceable in automotive applications. The effects of different duty cycles on the lifetime and performance of a LiNiMnCoO2 chemistry battery of 75Ah/module capacity and 14.4V/module voltage in four deployment scenarios was studied. The tests were performed on x modules and y cells following the IEC 61427 Standard Cycling test and the Protocol for Uniformly Measuring and Expressing the Performance of Energy Storage Systems (2016) by Sandia. Tests for peak shaving and PV smoothing have been integrated when following the Sandia 2016 Protocol. A mathematical battery model was created using (MATLAB) and the data was compared with the experimental results. A lifecycle assessment of the battery for secondary application was done and its environmental benefits were compared to that of a recycled battery.

SECOND-LIFE BATTERY APPLICATIONS FOR PHOTOVOLTAIC AND ELECTRIC VEHICLE CHARGE
Urusha Regmi (National Institute of Technology Karnataka), Kelsey Gross (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM

Poster: 218
Mentor(s): Annick Anctil (Civil & Environmental Engineering), Eunsang Lee (Civil & Environmental Engineering)

Batteries deployed in electric vehicles (EVs) reach their end of life (EOL) when their capacity degrades to 80% of the original. While no longer serviceable in automotive applications, these batteries could perform satisfactorily as energy storage devices in photovoltaic (PV) systems for peak shaving, PV firming and EV charging applications. Creating a market for EV batteries in a second-life application would not only add to their lifetime value but would also help overcome the cost barrier associated with owning an EV. It is suggested that returns will be made to the original owner according to the batteries' state of health at the end of its primary-life EV application. This incentivizes more people to use EVs, as a result of which the dependence on unsustainable energy sources as well as the emission of greenhouse gases is minimized. In this project, we perform tests to evaluate the remaining capacity of a second-life lithium ion battery to quantify its functionality in PV systems for four deployment scenarios: 1) Off-grid PV system use for EV charging, 2) On-grid PV system use for EV charging integrated with domestic utilities, 3) Off-grid PV system use for supercharging of EV and 4) on-grid utility peak shaving and PV smoothing. In accordance to the Sandia 2016 Protocol and the International Electrotechnical Commission standard, life cycle tests will be performed using an Arbin System with different duty cycles, C-rates, currents and Depth of Discharges (DOD) specific to each scenario, and the results will be analyzed according to the metrics outlined in the reports. Further, recommendations for second-use EV charging applications will be made.

EFFECT OF INFILTRATION DUE TO SURFACE DISCONTINUITIES ON RESILIENT MODULUS OF PAVEMENT UNBOUND LAYERS
Pranav Shah (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 219
Mentor(s): Syed Haider (Civil & Environmental Engineering), Gopikrishna Musunuru (Civil & Environmental Engineering)

All pavement sections exhibit cracking overtime because of traffic loads and environmental factors. Water can enter through surface cracks, untreated shoulders, and side ditches into the pavement sublayers. Water entering through the cracks increases the moisture content of the unbound layers in the pavement, decreases the resilient modulus, and ultimately affects pavement performance. Seasonal Monitoring Program (SMP) study in the Long Term Pavement Performance (LTPP) program provides valuable information regarding moisture content and temperature data in the unbound layers, precipitation, and cracking of 29 different SMP pavement sections. The aim of this research is to relate the effect of the change in moisture content to the resilient modulus of the unbound layers in the pavement. The change in resilient modulus of sublayers due to moisture infiltration is calculated using the Mechanistic-Empirical Pavement Design Guide (MEPDG) models. This change in the resilient modulus can be related to the change in pavement performance.

NUTRIENT RECOVERY THROUGH URINE DIVERSION, STRUVITE PRECIPITATION, AND ION EXCHANGE AT AN URBAN FARM
Ruiwei Sui (Michigan State University), Lucas Notarantonio
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 220
Mentor(s): Sanpreet Gill (Civil & Environmental Engineering), Rebecca Lahr (Civil & Environmental Engineering)

Phosphorus and nitrogen that exist in wastewater effluent due to excretion in urine are major pollution sources for eutrophication. The purpose of this research is to design and test a reactor that can effectively remove nutrients from human urine collected in a urine diverting toilet at an urban farm in Detroit and to recover the nutrients as fertilizer. The first stage of the fertilizer production reactor is a phosphate recovery process in which $MgCl_2$ is added to aged urine to precipitate struvite, a chemical fertilizer that forms when magnesium, ammonium, and phosphate exceed the solubility. The second stage of the reactor is an ion exchange column that traps ammonium using packed zeolite. The reactor is built using common, low cost materials such as plastic tanks, tubing, pipe, paddle, and filters which can be obtained in a wide range of situations. Nutrient recovery efficiencies are being optimized by monitoring influent and effluent quality, fertilizer composition, energy consumption, and cost during reactor operation. This research will inform the design, operation, and maintenance of the reactor for fertilizer production from urine at the Michigan Urban Farming Initiative built in collaboration with EcoWorks and the Youth Energy Squad. This work will serve as a field demonstration to improve urine diversion systems and achieve sustainability by fertilizer generation from waste.

TRANSPORTATION NETWORK MODELING BY SIMULATION-BASED DYNAMIC TRAFFIC ASSIGNMENT TOOLS DEVELOPED BASED ON STATIC MACROSCOPIC MODELS
Han Zheng (Michigan State University)
Category & Time: Civil and Environmental Engineering, Section 2, 2:30 PM - 3:45 PM
Poster: 221
Mentor(s): Ali Zockaie (Civil & Environmental Engineering)

The purpose of this project is to document the procedure of preparing inputs data for a simulation-based dynamic traffic assignment tool using the static macroscopic model. To create a dynamic model, an additional parameter, time, is introduced to a given static model. In the dynamic traffic assignment study, a time-based model is created to simulate more features than static model including dynamic traffic loading to the network and traffic controls at intersections. Therefore, the data, previously collected for the static model, is modified to be compatible with the new features and meet specifications of the dynamic traffic assignment tool (DYNASMART). In this research, Detroit regional transportation network is considered as the case study. To convert the traffic model from the static mode, which is provided by South East Michigan Council of Governments (SEMCOG), to the dynamic mode, to be modeled in DYNASMART, inputs traffic data are reformatted by both Python programs (main approach) and manual modifications using engineering judgment (the alternate approach). The main application of this project is to provide transportation planning agencies with a procedure to substitute the static macroscopic models, which is the current practice, with the simulation-based dynamic models that are capable to capture traffic dynamics and vehicles interactions more realistically.

COMPUTER SCIENCE AND ENGINEERING

ANALYSIS OF DIFFERENT GENETIC PROGRAMS
Justin Anderson (Hampton University)
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 224
Mentor(s): Armand Burks (Computer Science), William Punch (Computer Science)

Genetic programming is a popular form of evolutionary computation that models computer programs after genetic processes. The purpose of genetic programming is to predict solutions to a problem that is too time consuming or just too complicated for a human to solve by hand. Genetic programs also evaluate the "fitness" of individuals in the population of solutions formed by the genetic program. The genetic makeup of the solutions are nodes in a binary tree. New solutions are formed through traditional crossover methods when two "parent" solutions are "bred" together to produce two new solutions that share the genetic makeup of the parents. This study will clearly demonstrate the differences between traditional genetic programming and a new, multi-objective, form of genetic programming, genetic marker design. This study will also analyze the fitness and diversity of the large volume data produced by a traditional genetic program and a genetic program with genetic marker design with reusable, reproducible programming tools. Based on previous literature, the genetic marker design will increase the diversity of solutions and the chance of optimal solutions being found with different genetic makeup.

PARALLELIZATION OF TOPOLOGICAL DATA ANALYSIS
Majed Arrfedi (University of Maryland)
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 225
Mentor(s): Jose Perea (Mathematics)

Data science is a field that is used in a lot of disciplines, and the amount of data to be analyzed is always expanding. So in order to do topological data analysis more efficiently and with less time to ensure accurate data, some of its steps need to be done in parallel. This way the work will be divided among multiple computer cores or even multiple computers and thus the analysis would be much faster.

PHYSICAL LAYER SECURITY: SPOOFING LINK SIGNATURES
Gabrielle Beck (University of Michigan - Ann Arbor), Kevin Ponce Garcia (University of Puerto Rico at Arecibo)
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 226
Mentor(s): Tao Shu (Computer Science), Rui Zhu (Computer Science)

It is a common belief that link signatures between two different receivers and a transmitter are uncorrelated as long as the receivers are at least a quarter of a wavelength away from one another. However, this statement has not been proven in a mathematically rigorous manner so its validity is debatable. We propose that link signatures as they currently stand are vulnerable to attackers because it is possible for them to estimate the channel gain between a transmitter and receiver in an indoors, relatively static environment by using their own link signatures with the receiver. In our research, we will explore how feasible/plausible these attacks are in a real world setting and what some countermeasures may be to protect against them.

A BILEVEL OPTIMIZATION ALGORITHM BASED ON KRIGING APPROXIMATION MODEL
Samish Bedi (Birla Institute of Technology and Science Pilani)
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 227
Mentor(s): Kalyanmoy Deb (Computer Science & Engineering), Ankur Sinha (Production & Quantitative Methods)

A large number of application problems involve two levels of optimization, where one optimization task is nested inside the other. These problems are known as bilevel optimization problems and have been widely studied by researchers in the area of mathematical optimization. Bilevel optimization problems are known to be difficult and computationally demanding. Most of the solution procedures proposed until now are either computationally very expensive or applicable to only small class of bilevel optimization problems. In our study, we propose an improved global optimization algorithm for bilevel optimization using Kriging approximation based model on DACE predictor that tries to reduce the computational expense by iteratively approximating an important mapping in bilevel optimization; namely, the lower level optimal value function mapping. The lower level optimal value function is useful in reducing the two level optimization task to one; however, identifying this function is not straightforward. Our approach aims at metamodeling this mapping and solving a number of auxiliary single level problems to arrive at the bilevel optimum. We test the methodology on a number of test problems and compare the results with state-of-the-art benchmarks. The preliminary results are quite promising which suggest the viability of the approach in solving more complicated bilevel test problem. To the best knowledge of the authors, such kind of a solution procedure based on iterative approximation of mapping procedure has not been widely used in bilevel optimization. The proposed approach aims to bring down the computational expense significantly as compared to the contemporary approaches.

IMPERFECTIONS AND THE EVOLUTION OF INTELLIGENCE
Carolina Cabrera (University of Texas-Rio Grande Valley)
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 228
Mentor(s): Arend Hintze (Integrative Biology & Computer Science)

Why have we evolved neurons that make mistakes? Can the answer help us build better A.I.? Genetic algorithms are used to solve many complex problems including creating navigational strategies for robotic agents. However, these strategies cannot perform optimally because of differences between ideal simulated environments and imperfect real environments (imperfect signals, randomness in reality). One way to reduce this gap is by adding irregularities in the form of "noise" to the navigational strategy networks to create more general solutions through

the process of evolution. Markov Brain controlled agents with imprecise neurons are evolved such that their neural wiring produces foraging behaviors in a virtual environment to understand how computational noise affects the robustness of strategies produced by evolution. Markov Brains perform their computations using bits, either a zero or one. The objective of this study is to investigate if imperfection at the neuron level is selected for by evolution, and why this might be the case. The neuronal fidelity was implemented by using deterministic logic gates that have an additional epsilon (ε) error function, where ε defines the likelihood that an output bit is inverted. The effects of noise was explored in two ways: first by performing a parameter sweep over ε, and later by allowing ε itself to evolve. The latter allowed us to investigate if selection favors cognitive systems that minimize component noise to optimize performance, or if, as preliminary experiments suggest, selection favors a degree of component-level noise that enhances robustness and evolvability.

MACHINE LEARNING IN RECOGNITION OF HANDWRITTEN DIGITS
Charles Carroll (Michigan State University)
Category & Time: Computer Science and Engineering, Section 2, 1:00 PM – 2:15 PM
Poster: 230
Mentor(s): Jose Perea (Computational Mathematics, Science & Engineering)

A Neural Network is a biologically inspired learning system that is used to estimate functions that depend on a large number of inputs that of which are generally unknown. With the development of Neural Networks they have been used in the making of face recognition software, self-driving cars, email spam detection, and so on. As part of Project Google Brain, the Machine Learning library, Tensorflow, has been open sourced for any and all to use. The goal right now is to understand the inner workings of Artificial Neural Networks and learn how to use Tensorflow to tackle the problem of hand written digit recognition. For this project we will be using several resources developed by the pioneers of Artificial Neural Networks and Machine Learning. These sources include Neural Networks and Deep Learning written by Michael Nielsen, Neural Network examples, and lectures on Machine Learning by Andrew Ng. Future work will include the training of Sparse Encoders which have been shown to produce biologically consistent feature detectors.

PHENOTYPIC PLASTICITY AS A COMPONENT FOR EVOLUTIONARY COMPLEXITY USING ARTIFICAL EVOLUTION
Michael Cash (Florida International University)
Category & Time: Computer Science and Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 231
Mentor(s): Alexander Lalejini (Computer Science & Engineering), Charles Ofria (Computer Science & Engineering)

In the biological community, complexity is a term that is difficult to define in evolution. Parts of the community see complexity as an organism's mechanism to learn its surroundings while others see it as structures, or characteristics, that have evolved from more simpler structures in a gradual evolutionary process. We question what is complexity in evolution and what contributes to its evolution? We focus on both definitions of complexity to observe whether an organisms ability to obtain information about its environment causes evolution of complex phenotype from previous, simpler ones. Studying evolution, however, can be a lengthy process in a natural environment. We study evolution through artificial life using digital organisms, computer programs with the ability to self-replicate and evolve. We observe whether phenotypically plastic organisms, or organisms that use information about their environment to express different phenotypes, are capable of evolving a complex phenotype from simpler phenotypes. The Avida software platform for digital evolution is used to generate populations of digital organisms to test whether phenotypically plastic organisms are able to promote the evolution of complexity compared to non-phenotypically plastic organisms in changing environments where two phenotypes are either promoted or punished in the environment. A complex phenotype will be introduced to test the evolution of complexity which will always be rewarded, not matter the environment. It is expected that both types of digital organisms will evolve the third phenotype. However, the phenotypically plasticity organisms will evolve the third phenotype at a quicker rate.

AN INFORMATION-STATE-BASED ACTION POLICY FOR HUMAN-ROBOT DIALOGUE
Sarah Fillwock (Michigan State University)
Category & Time: Computer Science and Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 232
Mentor(s): Joyce Chai (Computer Science & Engineering), Changsong Liu (Computer Science & Engineering)

In a situated, task-learning dialogue between a robot and a human teacher, the robot must contribute to the dialogue in a way that elicits relevant task information from the human. The robot's selection of a dialogue action depends on both its understanding of the current dialogue situation and the completeness of its task knowledge. To implement a human-robot dialogue system, these two sources of information must be operationalized into an information state, which extracts features from the robot's visual and linguistic processing. In addition, an action policy must be defined that selects the best response given a set of feature values. In this work, we identify features from vision and dialogue that represent the robot's current understanding of the task, the grounding conditions of the objects involved, and the communicative actions taken by the participants. We then define an action policy that selects an action given the current information state. In order to improve upon this initial action policy, we integrate our information state and action policy into a previously implemented human-robot dialogue system. We then interact with the system to collect dialogues and the task structures learned from them. For each dialogue, the task structure is also manually created for comparison to the system's task representation to determine accuracy and efficiency metrics of the current action policy. Using this evaluated data, we improve the policy by determining patterns of errors to correct. We present a summary of the information state and the evolution of the action policy we developed.

ERROR IDENTIFICATION AND HANDLING STRATEGIES IN SITUATED DIALOGUE
James Finch (Michigan State University)
Category & Time: Computer Science and Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 233
Mentor(s): Joyce Chai (Computer Science & Engineering), Changsong Liu (Computer Science & Engineering)

In a dialogue between two agents, dialogue errors such as misunderstandings are impossible to avoid completely. To enable robust human-robot collaboration, robotic systems must be designed with the ability to detect errors from error cues that arise in dialogue and handle these

errors as they occur. We formalize the robot's selection of an error handling strategy given a set of error cues as a probabilistic classification problem. The goal of the classifier is to automatically detect errors by analyzing the dialogue history. Based on these detected errors, the robot must then use an error handling strategy to efficiently correct the erroneous information it has acquired. In this work, we aim to identify potential cues and handling strategies for various dialogue errors, which will later inform the design of a robust, data-driven error-handling classifier. To identify these cues and strategies, we created a variety of heuristic error handling rules that we implemented within a previously built end-to-end human-robot dialogue system. Using a number of dialogue scenarios, each with a specification for the correct system interpretation, we evaluated the ability of different heuristic error detection and handling rules to recover from dialogue errors. We present a summary of the heuristics we tested, along with their F-scores for error detection and how often they were able to recover from the errors they detected. The successful identification and handling heuristics presented will respectively become the feature extractors and classes in a probabilistic error-handling classifier in future work.

SPECIATION IN DIGITAL ORGANISMS
Justus Grant (Michigan State University)
Category & Time: Computer Science and Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 234
Mentor(s): Clifford Bohm (BEACON Center for the Study of Evolution in Action), Arend Hintze (Integrative Biology)

Digital Organisms run in the MABE (Modular Agent Based Evolver) system are capable of simulating evolution and allows users to study evolutionary processes in ways that are impractical in nature. This study seeks to determine whether or not digital organisms in a well-mixed population placed in a closed environment undergo the process of speciation and if so, observe the processes that cause this.
The MABE system will be used to run multiple tests speciation by placing digital organisms in an open environment and allowing them to reproduce and evolve to effectively complete a task . Different parameters will effect the organisms in each test. Given certain conditions, speciation can be observed in the evolution of digital organisms and is likely caused by the process of hybrid incompatibility.

TRACKING AND MONITORING DATA TRANSMITION IN ANDROID OS
Alexandra Hanton (Loyola University Chicago)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 2:30 PM
Poster: 236
Mentor(s): Hani Alshahrani (Computer Science), Abdulrahman Alzahrani (Oakland University), Huirong Fu (Computer Science)

Most of the millions of Android users worldwide use third-party applications from the Google Play store to get more functionality from their devices. Many of these applications transmit sensitive data stored on the device, either maliciously or accidentally, to outside networks. In this project, we study the ways that Android applications from the Google Play store transmit data to outside servers and propose a user-friendly application to inform and protect the user from these security risks. We use tools such as TaintDroid, AppIntent, and Securacy to develop an application that reveals what types of data are being transmitted from applications, the location to which the data is being transmitted, whether the data is being transmitted through a secure channel (such as HTTPS) and whether the user is aware that the information is being transmitted. The application will generate a report that allows the user to block the application that leaks sensitive information. In doing so, we will examine the importance, relevance, and prevalence of these Android data security issues.

SYSTEM ANALYSIS USER INTERFACE FOR MODALITY-INDEPENDENT DEVELOPMENTAL NETWORK
Jose Hernandez (Michigan State University)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 237
Mentor(s): Juan L. Castro (Computer Science), Juyang Weng (Computer Science)

Background:Artificial Intelligence (AI) has become an important tool for the scientific community over the last century. Methods like Artificial Neural Networks, Support Vector Machines, and Genetic Algorithms are utilized to solve human cognition tasks such as object recognition and speech processing. The Developmental Network (DN) is a new method capable of emergently learning a Turing Machine (TM) in a real-time grounded environment with natural encodings or pattern inputs instead of symbols. This allows the DN to autonomously learn a TM without any predefined knowledge from external factors, like programmers or other systems. Although these methods show great results, many still face similar issues. These issues include long periods of running time, large amounts of data required for training, and high memory consumption.A Graphical User Interface (GUI) will be developed to assist with the analysis of the DN. The GUI will monitor the machine's memory-consumption and running time while the DN is running. Then the GUI will output a summary of memory usage, running time, and accuracy. From this information the amount of neurons to be trimmed will be determined.
Expected Results:After running this method with different amount of neurons, different statistics will be outputted from the optimization procedure. As the number of neurons are being reduced, we predict there will be an increase in the DN's system performance by optimizing memory-consumption and execution time while maintaining a high percentage of accuracy.

RISKS OF SPECIAL ANDROID PERMISSIONS
Anthony Hewins (Oakland University), Maria McCulley (University of Maryland College Park)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 238
Mentor(s): Ali Alshehri (Computer Science), Huirong Fu (Computer Science)

Today, people can do most of their daily work using their smartphones due to the significant improvement in smartphone technology. Therefore, there are a massive number of applications in the market that carry a large amount of sensitive personal data. In Android mobile, there are many malicious applications that aim to collect users' sensitive data without user awareness. Users can agree on a list of permissions that are required by an application during the installation process without understanding how these permissions could lead to privacy leaks or attacks. Most of the applications in Android market require permissions to access the device information such as IMEI, IMSI, phone number and Android ID. In our project, we will study each element of system information and present some attack scenarios using these permissions to make the Android community aware of the risks they take by granting the permissions that access or use the device information.

DEVELOPMENT OF USER INTERFACE DESIGN FOR HIGH-THROUGHPUT IMAGE ANALYSIS
Jingyi Liu (Michigan State University)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 239
Mentor(s): Dirk Colbry (Computational Mathematics, Science & Engineering), Rance Nault (Biochemistry & Molecular Biology)

The manual quantitation of histological features for the determination of tissue damage and disease is a time-consuming process for pathologists. To address this problem, the Quantitative Histological Analysis Tool (QuHAnT) framework was developed to automate quantitation of histology images in a rapid and reliable manner. For distribution to the end user, a web-based submission system is being developed which will allow users to take advantages of our quantitative framework for their own large scale datasets. The user interface (UI) plays a critical role in making the tool accessible to users, providing them an easy and reliable experience while using our system. The goal is to build a UI not only for the professional people but also for the regular scientists. Several aspects are considered in the development of the robust UI including feedback, error handling, system consistency, etc. This project investigates the design of the UI for both web-based system and mobile application which is fully integrated with QuHAnT analytics performed in the cloud. The apply of Cordova which uses CSS, Javascript, and HTML to help accomplish the multi-platform mobile application and communicate with Joyent-Manta cloud services using Node.js. Testing and evaluation of the UI for this project will systematically evaluated for intuitive ease of use.

APPLICATION OF DEEP RECURRENT NEURAL LEARNING TO COMPUTER SECURITY BREACHES
Ephraim Nielson (Utah Valley University), Paloma Symmonds (Emby-Riddle Aeronautical University)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 240
Mentor(s): Mohamed Zohdy (Engineering & Computer Science)

Advancements of technology in the field of networks and computing bring with it a heightened importance of cyber security. Currently, legal forms of identification, financial information, scientific data, and state records rely on this technology - and as we become more dependent on cloud computing, data-base storage, and online banking, greater measures of keeping information safe is paramount. Because of this cyber-attacks will have the ability to inflict more damage on a larger demographics and will become more sophisticated and complex as technology advances. Because of this, a more robust method of securing information against poor programming, interpreted protocols, and design loop-holes will need to be developed in the event of cyber-attacks. Here we will demonstrate the feasibility of using a recurrent neural network as a method of tracking changing methods of cyber-attacks as they evolve with better camouflaging techniques. We introduce the concept of 4D as a method of securing online information: deter, detect, delay, and defend. Creation of a server called "The Honeypot" will be analyzed for cyber-attacks. The implementation of our defense mechanism will be performed using a recurrent neural network with deep learning model to make it a more robust protection against such attacks.

THREE-DIMENSIONAL RECONSTRUCTION OF DISLOCATIONS IN METALLIC CRYSTAL LATTICE STRUCTURES
Zayd Radha (University of Michigan)
Category & Time: Computer Science and Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 241
Mentor(s): Shanoob Balachandran (Chemical Engineering & Materials Science), Dirk Colbry (Computational Mathematics, Science & Engineering), Martin Crimp (Chemical Engineering & Materials Science)

Crystalline structures, such as most metals and ceramics, contain defects known as dislocations. These defects, which are line defects along which the atomic bonds are disrupted, control deformation in metals and influence the electronic properties of device materials. The dislocation line directions can be described as three-dimensional vectors (Burgers vectors) in the crystal lattice structures. Material scientists who study these dislocations are currently unable to map their 3-D positions in volumes with thicknesses greater than a few hundred nanometers. The goal of this project is to create a reproducible method that will allow mapping of dislocations over much larger 3-D volumes, with thicknesses ranging to tens of micrometers. The technique that we are developing to carry out this tomographic mapping includes capturing images of the surface of a metal sample using electron channeling contrast imaging (ECCI), and repeating this image capture on a layer-by-layer basis by milling the sample with a focused ion beam (FIB). After capturing the layers, each image is being analyzed individually to detect individual dislocations using a conjunction of computer vision algorithms, currently involving a scale invariant Sobel mask and Difference of Gaussian pyramid, and produce coordinates points and two dimensional vectors for each layer. We then pair the dislocations coordinates in adjacent layers based on their proximity (and possibly their Burgers vectors), which leads to pairs of coordinates in three dimensions that can be modeled as vectors representing the dislocations.

DETECTING JAVASCRIPT VULNERABILITIES THROUGH THE ABSTRACT INTERPRETATION OF STRINGS
Koby Picker (Case Western Reserve University), Christian Maldonado
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 243
Mentor(s): Lunjin Lu (Computer Science & Engineering)

JavaScript is ubiquitous online. It's important then, that web applications which use JavaScript are secure against common string manipulation exploits such as SQL injections and cross-site scripting attacks. JavaScript is dynamically typed, and objects can have their methods and properties dynamically modified at runtime -- thus, static analysis tools are a challenge to implement and security analysis tools are consequently limited. We propose the abstract interpretation of JavaScript strings into finite state automata. We augment TAJS (Type Analyzer for JavaScript), an open source dataflow analysis tool for JavaScript, in order to precisely approximate strings in real-world JavaScript code, and warn against common vulnerabilities.

COMPUTER SCIENCE: RUDIMENTS OF COMPUTER SCIENCE THROUGH DANCE
Matthew Rhodes (Michigan State University), Noah Keppers (Michigan State University), Madeline Levinson (Michigan State University)
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 244
Mentor(s): Charles Owen (Computer Science)

Computer Science education and introductory programming has traditionally focused on teaching students how to write programs. Knowing how a computer reads and executes code is just as important. By applying STEAM principles to CS education, the Dancing Computer project examines the impact of the use of dance in teaching programming. Dancing Computer was created as an offshoot of Theatre Engine: Flashmob, and the concept was successfully tested at Winans Elementary school in April 2015 and Brownell STEM Academy YouthQuest program in Flint in May 2015. Dancing Computer utilizes a set of Android tablets controlled by a server. Each tablet displays step-by-step instructions telling students where and how to move on a colorful gridded dance floor. By moving step-by-step through each dance, students "execute" instructions just like a computer would execute lines of code. Lights and music are used to indicate if the lines of code are executed correctly - error sounds are used when students incorrectly follow directions. As they graduate to more complex dances, more programming concepts such as variables and conditional statements are also introduced, as well as several dance concepts. After a few completed dances and after increasing the level of difficulty, participants will have a basic understanding of what a computer program does and how it functions. The effectiveness of the Dancing Computer activity will be assessed through analysis of video footage taken of the program in action during visits to area schools as well as a planned exhibit at the Impression 5 Science Center.

ANALYSIS OF IMAGE UPLOAD METHODS FOR QUANTITATIVE HISTOLOGICAL ANALYSIS TOOL (QUHANT)
Anna Schmidt (University of Michigan)
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 245
Mentor(s): Dirk Colbry (Computational Mathematics, Science & Engineering), Rance Nault (Biochemistry & Molecular Biology), Timothy Zacharewski (Biochemistry & Molecular Biology)

The histological evaluation of tissue sections by pathologists plays an essential role in identifying tissue damage or disease. With current technology, pathologists are forced to count cells by hand, a time-consuming and inexact process, prompting the creation of the Quantitative Histological Analysis Tool (QuHAnT). QuHAnT is a computational approach developed to automatically gather quantitative data from digitized histological images allowing faster and more accurate image analysis by pathologists. The tool, consisting of a web-based submission system, must have the ability to upload thousands of images rapidly and reliably. In its current iteration, the QuHAnT submission does not efficiently manage image uploads. Therefore, the purpose of this project is to benchmark the current upload process and test potential improvements. The upload section of the cloud based tool is written in Node.js, a language that has many add-ons and plugins available, in order to communicate with the Joyent-Manta service which is used for QuHAnT analytics. In order to optimize image uploads plugins, structural frameworks and additional web servers are explored to improve upload speed, user knowledge and implementation of background uploading. We determined that one of the most substantial improvements would be to change the user interface, showing the user which images had been uploaded. We also looked into ways to allow the user to move to another page while continuing the upload in the background. Our results will be used to improve the QuHAnT tool and can be applied to other websites that have similar needs.

ANDROID APPLICATION PERMISSION MANAGER (AAPM): EDUCATE, INFORM AND PROTECT ANDROID USERS FROM MALICIOUS APPS
Katherine Schwartz (Oakland University)
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 246
Mentor(s): Eralda Caushaj (Computer Science & Engineering), Huirong Fu (Computer Science)

Android applications (apps) request access to device resources and data, such as storage, GPS location, camera, microphone, SMS, phone identity, network information etc. When app permissions are required, the user will be prompted to grant them. Often, an app will not have full functionality if the user refuses to allow it to access these resources. Legitimate mobile apps, advertisements (ads) and threats all require access to mobile resources and data in order to properly function. How is it possible to minimize the risk of threats and ads on mobile devices? We have implemented the Android Application Permission Manager (AAPM), an app that will educate, inform and prevent users from installing malicious apps. Our framework considers the following 5 features: (1) dangerous combinations of permissions, (2) ad networks associated, (3) the number of possible privacy threats, (4) the range of permissions in the app's category, and (5) over-privileged app permissions. The features of our app are demonstrated by analyzing 1590 top free/paid apps from Google Play, the official Android market.

INTERFACE FOR PARTICULATE ORGANIC MATTER IMAGE PROCESSING AND ANALYSIS
Kenneth Stewart (Michigan State University)

Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 247
Mentor(s): Dirk Colbry (Computational Mathematics, Science & Engineering), Sasha Kravchenko (Plant, Soil, & Microbial Sciences)

POM is a MATLAB program designed to assist scientists in the analysis of plant organic matter in CT images of soil samples. The software is built off a prototype multistage workflow that uses ImageJ, FORTRAN, and SAS. The POM Graphical User Interface attempts to streamline the workflow by minimize the time a researcher spends analyzing images. MATLAB is used to replace sections of the workflow written in SAS and acts as a glue by communicating directly with FORTRAN and ImageJ. The workflow of POM is divided into steps navigable by an intuitive interface. Algorithm parameters are taken at the initial step to be used throughout, with default parameters designed to provide the user with examples of the input that is expected. POM make the analysis of plant organic matter using CT scans easy and accessible to scientists enabling new types of research questions such as how the carbon in the plant organic matter of soils may affect climate change or how soil can be maintained to improve crop yield.

DEVELOPMENT OF IMAGE QUALITY CONTROL MODULE FOR WEB-BASED IMAGE SUBMISSION SYSTEM
Daria Tarasova (Michigan State University)
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 248
Mentor(s): Dirk Colbry (Computational Mathematics, Science & Engineering), Rance Nault (Biochemistry & Molecular Biology), Tim Zacharewski (Biochemistry & Molecular Biology)

The current gold standard for quantitation of histological images is the manual identification of features from each image by a trained pathologist; a time-consuming process. The Quantitative Histological Analysis Tool (QuHAnT) is a computational approach developed to quantitate features of interest from digitized histological images in a high-throughput manner, allowing faster and more accurate image analysis by pathologists. A significant challenge in the automation of quantitative pathology is the identification of poor quality images which could result in inaccurate assessments. This project describes the development of a pre-processing quality control module which identifies the presence of common features including blurry regions, images with no tissue, false positive staining and bubbles that could negatively impact computational quantitative assessments. The development and testing of the modules was performed using iPython notebooks with validation conducted through a web-based image submission system in C++ to ensure an optimal performance time. Module development and testing was performed by providing the modules with images ranging in the amount and severity of poor quality indicators and confirming the output through visual inspection. The validation of the modules ensures that QuHAnT analytics uses only high quality images, providing confidence in the results to the end user.

PARALLELIZED PHYLONET-HMN ALGORITHM FOR SPECIES TREE INFERENCE FOR LARGE DNA SEQUENCE DATA
Yayu Zhou (University of Illinois)
Category & Time: Computer Science and Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 249
Mentor(s): Kevin Liu (Computational Mathematics, Science & Engineering)

Introgression is a result of interspecific hybridization and subsequent effects of evolutionary forces. It is the permanent transfer of genetic variants from one species to another. Previous researchers introduced a new framework, PhyloNet-HMM, to detect introgression in genomes (Liu et al. 2014). This comparative genomic method allows for modeling point mutations, recombination, and introgression, and it accounts for incomplete lineage sorting and dependence across loci. While the PhyloNet-HMM detected the reported introgression with high confidence and generated accurate results on the simulated data, it can be improved in some aspects. The MUL-tree technique mentioned in the paper can be utilized to extend the model to more general data sets with arbitrary hybridization and speciation events, but as larger data sets become available, computational requirements become more intensive. Furthermore, all their work so far was built on the assumption that the phylogenetic network is known, which is not the case in practice, so it is meaningful to present a practical procedure to relax this assumption. In this project, we expect to report a parallelized version of the PhyloNet-HMM algorithm, which can speed up the computational process, and we will evaluate its performance on larger scale DNA sequence datasets.

ELECTRICAL AND COMPUTER ENGINEERING

3D UNDERWATER DIRECTIONAL COMMUNICATION USING LED
Amin Almozel (University of Rochester)
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 250
Mentor(s): Xiaobo Tan (Electrical & Computer Engineering)

The most commonly used underwater communication systems typically use sound waves to propagate information. Using sound waves, or sonar, to communicate introduces a high latency, has low bandwidth, has a high cost, and uses a lot of power. An alternative solution is to use the pulsing of LED light for information transfer. In the prior work of Smart Microsystems Lab at MSU, proof-of-concept LED-based communication devices have been developed that can look for, and communicate with other similar devices on the same plane, using a one-degree-of-freedom motor that controls pan (rotation). The goal of this project is to extend that work and f build a pair of LED communication transceiver prototypes capable of both pan and tilt, so that the devices can scan the three dimensional (3D) space, and to develop strategies for searching and maintaining line of sight between the two communicating nodes. Experimental results on prototyping and testing are reported.

A PHOTOSENSITIVE PROTEIN THAT ALLOWS FOR EFFICIENT CONTROL OF GENE EXPRESSION IN HUMAN CELLS WITH BLUE LIGHT STIMULATION
Nathan Blanke (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:15 PM

Poster: 251
Mentor(s): Erin Purcell (Biomedical Engineering, Electrical Engineering)

Light-inducible gene expression systems have emerged as a promising method to pattern cell fate with precise spatiotemporal control, yielding an attractive approach for applications in regeneration and bioelectronic interfaces. Notably, optical stimulation has the benefit of being able to penetrate tissue with minimal toxic effects, as compared to electrical stimulation. EL222, a protein derived from the bacteria E. litoralis, is a photosensitive protein that will dimerize and bind to a complementary strand of DNA upon blue light stimulation. Human embryonic kidney (HEK) cells are cultured, and then genetically modified, via transfection of plasmids encoding the photosensitive transactivator and the response elements. The complementary DNA strand is engineered to have a transcriptional promoter region, and a reporter vector, inserted downstream of the EL222 binding sequence. The plasmid is tagged with green fluorescent protein (GFP) to verify successful transfection, and the gene of interest is a red fluorescent reporter after blue light irradiation. Fluorescent microscopy is used to determine the expression response and efficacy of different types of light stimulation. The exposure conditions for optimal gene induction have not been determined for this light-driven transcriptional system, and the response to varied parameters are observed and imaged to characterize its ability to spatially control gene expression. Eventually this system will be applied to rat neural progenitors to pattern specific gene expression that enhances development and connectivity of neuronal subtypes. Future implications of light-driven gene expression systems are their potential role in improving the interface between neural tissue and implanted devices.

CONTROLLING LéVY FLIGHT BEHAVIOR IN PLASMAS
Jacob Bullard (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 252
Mentor(s): Rahnuma Chowdhury (Electrical Engineering), John Verboncoeur (Electrical Engineering)

Plasmas are ionized gases which act as a fluid of ions and electrons flowing and interacting with each other. The ions in the plasma can collide and cause various chemical reactions depending on the reactants. We are investigating Lévy flight behavior for the collision energies of the particles within the plasma. Lévy flight is a random walk in which the step-lengths have a probability distribution that is heavy-tailed. If the particles are expressing Lévy flight behavior, and the convergence value of the probability distribution proves to be tunable, we will be able to select for specific higher energy collisions. This would allow for the selection of higher energy reactions to occur more frequently. Currently we are investigating if Lévy flight behavior occurs under various conditions, and if so, can we tune the convergence value based on those parameters. We are currently doing this with a log-log plot of particles vs. the square of the differential velocity per time step. Without Lévy flight we would expect a standard exponential decay as energy levels rise, with Lévy flight we should see a slower decay which isn't quite exponential. Currently we have mixed results. Previously, we received data which suggested Lévy flight behavior, and more recent simulations with modified code suggest we aren't seeing it anymore. We are now investigating which result is correct and why the other might be saying the opposite.

A PORTABLE VIRUS SAMPLING SYSTEM FOR UNDERWATER ROBOTS
Sunho Choi (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 253
Mentor(s): Xiaobo Tan (Electrical Engineering)

Underwater robots that are highly maneuverable and energy-efficient allow detailed environmental monitoring that was previously difficult and laborious to achieve. Monitoring the level of pathogens, especially viruses, is important to water quality and safety. A standard method for waterborne viruses involves collecting water samples for laboratory analysis. However, the apparatus used in the standard method is non-waterproof, energy inefficient, and bulky to be directly implemented on an underwater robot. The purpose of this project is to design a compact and energy-efficient sampling system that can be readily integrated with an underwater robot. The design consists of a cartridge housing made for a standard virus filter that is cut in half, a small brush-less motor, and a check valve to prevent back flow. It has an axial flow direction where water flows from front to back as it is being sampled through the filter. Experimental results on prototyping and testing of this design are reported.

ENHANCING MRI IMAGES USING SMART MATERIALS AND SOFT ROBOTIC TECHNIQUES
Demetris Coleman (Auburn University)
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 254
Mentor(s): Thassyo Pinto (Electrical & Computer Engineering), Chunqi Qian (Radiology), Xiaobo Tan (Electrical & Computer Engineering)

The pituitary gland is a small gland found inside the skull just below the brain and above the nasal passages. It releases hormones and controls the levels of hormones produced by most other endocrine glands in the body. Tumors on this gland can lead to adverse health effects by causing an excess release of hormones and some can be cancerous. In addition, if the tumor becomes larger than about a centimeter, it can grow to compress and damage nearby parts of the brain. Currently, MRI scans are considered to be the best way to detect pituitary tumors, but machines sometimes lack the detail to detect smaller tumors. One way to improve the imaging is to obtain a local image with a coil in close proximity to the desired viewing area to obtain. In this paper, we focus on using soft robotics techniques and materials to design a fixture that can safely enter the human body while in an MRI machine and insert a coil near the pituitary tumor via the nasal cavity. Beyond enhanced detection of pituitary tumors, this research has an impact on applying soft robotics to surgeries and medical procedures.

FREQUENCY RECONFIGURABLE PIXELATED PATCH ANTENNA FOR SMART DEVICES
John Doroshewitz (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 256
Mentor(s): Premjeet Chahal (Electrical & Computer Engineering)

There is significant growth in smart devices ranging from cellular phones to devices for Internet of Things (IOT). New generation of smart hand-held devices require antennas for cellular, blue tooth, RFID reader, etc. It is becoming very challenging to integrate such a large number of antennas in a small lattice. In order to overcome this challenge reconfigurable antennas are being investigated. Here, a pixelated patch antennas is being investigated for such a purpose. The use of pixilation of a simple inlet-fed patch antenna is the basis for new frequency tunable antennas. Semiconductor use as well as RF switches are offered to turn on and off individual pixels in the array. Electromagnetic simulations (using commercial tool HFSS) show the feasibility of this design. Antennas can change their main resonant frequency by turning on or off just one of the over 600 pixels. Radiation patterns are also observed to test the idea that these pixilated patch antennas could also be used to for beam steering. The simulations were tested through fabrication on Rogers board and silicon wafers. Simulation and measured results will be presented.

REDUCING COSTS OF DATA LABELING USING SLAM
Ryan Gallant (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 257
Mentor(s): Daniel Morris (Electrical & Computer Engineering)

In order to become autonomous, a vehicle needs to categorize objects in its environment. Instead of using classifiers designed by hand, which have difficulty dealing with more complex obstacles, we propose training a classifier to differentiate between different kinds of obstacles. However, this training requires large quantities of labeled data, which involves significant manual effort. Our approach in tackling this problem is to construct a mapping system using a Simultaneous Localization and Mapping (SLAM) service to easily label large quantities of data. By labeling the map and transferring the map labels to the large quantities of sensor data, the amount of time and effort required to train a classifier is greatly reduced. The system is tested by training a classifier to discriminate between foliage and other obstacles.

BREAKING TRADITIONAL PERFORMANCE LIMITS OF MEMS MIRROR BY REGULATING INPUT POWER
Ian Gonzalez Afanador (University of Puerto Rico at Mayaguez)
Category & Time: Electrical and Computer Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 258
Mentor(s): Nelson Sepulveda (Electrical & Computer Engineering)

Microelectromechanical Systems (MEMS) mirrors are useful for expanding the capabilities of optic devices: in digital light processing (DLP) they help project images by redirecting light at very small scales and in medical imaging they allow endoscopes wider fields of view, lessening the need for movement and decreasing danger to the patient. Typical MEMS mirrors are limited by power consumption, unidimensional movement, size or toxicity of materials used to fabricate them. One solution which reduces power consumption, while simultaneously avoiding the other issues is the use of phase change materials to move the mirror. However, this approach is much more difficult to control due to being highly sensitive to the current or voltage signals typically sent to actuate the mirrors and having a non-linear response. These signals can produce different temperatures at the actuators which result in asynchronous actuation and a non-uniform displacement of the mirror. The goal of this research is to improve the control over these mirrors by regulating the input power to the actuators via the design and implementation of an external power compensation circuit. In order to verify an improvement in control, an optical rig with a high magnification lens and a high resolution camera will be set up and utilized with open source tracking software to measure displacement. A preliminary circuit has been designed and is being tested; once this circuit design is validated it will be incorporated into an integrated circuit. We expect that power compensation will allow for synchronous actuation of the mirror.

AEROSOL JET 3-D PRINTING OF COMMUNICATION SYSTEM COMPONENTS
Leonardo Hernandez (University of California Riverside)
Category & Time: Electrical and Computer Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 259
Mentor(s): John Papapolyperou (Electrical & Computer Engineering)

Over the past couple of years, engineers have been interested in creating 3-D printable components for communication systems. The reason manufacturers and companies would like to switch to 3-D printing as opposed to the conventional manufacturing of these devices, would be because of its ability to create less waste as opposed to subtractive manufacturing. Companies can also fabricate their own designs instead of waiting for their finished product to be produced. This will cut their cost in transportation by simply having to order raw materials instead of individual goods. The type of radio frequency, R.F., this research is interested in is the step impedance low pass filter. In particular, these filters tend to be used as transmission lines which, carry signals with the least amount of distortion as possible over long distances. In general, the construction of this component has been done in two phases. The first phase takes place using the High Frequency Structure Simulation, HFSS, ANSYS electronics Software. Using known concepts of RF filters, the basic structures will be derived and modeled according to the specifications. From the simulation results, the model is then altered in order to achieve the intended results. Once the intended results are reached, phase 2, hardware implementation, would take over using Polyjet and Aerosol Jet printing. The prototypes are then measured using the s parameter measurement device called Performance Network Analyzer, PNA, to make sure it matches the intended results. The goal of this research was to create a stable printed RF filter.

JOINT COLOR AND STEREO VISION TARGET TRACKING WITH A COMPLEX BACKGROUND ENVIRONMENT
Emmanuel Mendez Alicea (University of Puerto Rico - Mayaguez)
Category & Time: Electrical and Computer Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 260
Mentor(s): Daniel Morris (Electrical & Computer Engineering)

This research project involves the design and implementation of a target tracking system for moving and stationary objects using a stereo camera mounted on an Unmanned Aerial Vehicle (UAV). The goal is to give the UAV the ability to track and fixate on plants that might be sick, so farmers can use them for monitoring and verifying their crops instead of sending many workers to the field. The proposed tracker combines stereo depth and color information and outputs the target plant location. The plant's location relative to the UAV is obtained from its pixel coordinates (x,y) along with stereo depth. Precise location information is needed to enable close-in inspection of the target plants. The selected camera to be mounted in the UAV is the ZED Stereo Camera from Stereolabs which is going to be connected to a Jetson TX1, a small portable computer with GPU-accelerated parallel processing. The coding can be done directly on the Jetson in C++ using libraries like OpenCV, which possess the necessary optimized algorithm for real-time vision applications such as this project.

GANFETS
Socrates Montero (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 262
Mentor(s): Fang Peng (Electrical & Computer Engineering)

In the power electronics world, switches and creating other paths for currents to flow helps provide electrons flow through circuit boards. Throughout the history of power electronics metallic oxide semiconductor field-effect transistor (MOSFETs) have been prominently used as switches to control a low voltages at high frequencies by having a gate, source, drain, and body. A newly introduced technology in this aspect is the Gallium Nitrite semiconductor field-effect transistor (GaNFETs) in theory this technology is breakthrough because it helps you to control more energy through the channel at a higher frequency. Through trials of comparison of both types of semiconductors I will see the switch on and off time and the conservation of energy at the drain.

NDE METHODS FOR INSPECTING DEFECTS IN COMPOSITES
Vijay Krishna Nallapaneni (National Institute of Technology Durgapur)
Category & Time: Electrical and Computer Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 263
Mentor(s): Lalita Udpa (Electrical & Computer Engineering)

Composite materials are being increasingly used to replace metals largely due to the light weight and high mechanical strength. An important aspect of composites is the development of sensors and techniques to inspect these materials for defects such as disbonds, delaminations, fiber breakage and impact damage. Nondestructive Evaluation (NDE) is the study and development of techniques that detect anomalies that compromise the structural integrity of materials. A number of NDE methods, such as electromagnetic, ultrasonic, thermal, radiographic, etc. has been developed based on the type of material that is inspected. In this project NDE of composite materials using low frequency electromagnetic methods will be discussed. Two different sensors, one using a magnetic coil and a second using an open plate capacitor will be studied. Composite materials based on both Carbon and Glass fiber reinforced polymers (CFRP and GFRP) will be studied using eddy current coil and capacitive probes to detect cracks and. Using a simulation model, we will investigate how sensitivity of the system varies with parameters such as geometry of the probe, frequency and defect shape and size. The effects of sensitivity with different parameters on five different sensors will also be analyzed to optimize the probe design.

OPTOGENETIC CONTROL OF FREELY BEHAVING RODENTS USING A BIDIRECTIONAL OPTRODE ARRAY
Taylor Patrick (University of Maryland Baltimore County)
Category & Time: Electrical and Computer Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 264
Mentor(s): Wasif Khan (Electrical & Computer Engineering), Wen Li (Electrical & Computer Engineering)

The objective is to use the optrode array to send previously recorded signals to the visual cortex to stimulate/induce visions in the animal. The stimulation experiment requires that the animals be trained in a cage area a visual stimulus and a food reward. Although several surgeries have been conducted, none of the animals have survived long enough to have the light experiment done on them. Further changes in the project process are prospect to change in order to accommodate the animals survival.

LANE, ROAD AND VEHICLE DETECTION FOR AUTONOMOUS VEHICLES
Joshua Peeples (University of Alabama at Birmingham)
Category & Time: Electrical and Computer Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 265
Mentor(s): Hayder Radha (Electrical & Computer Engineering)

Each year millions of people die or get injured as a result of car accidents. A majority of these car accidents are due to driver faults such as drunken driving, texting while driving, driving while tired, negligent driving and other preventable acts. As a result, the need for autonomous or self-driving vehicles is created. Several aspects of autonomous vehicles that are necessary are lane, road landmark, car, pedestrian and sign detections in order to provide the autonomous vehicle with all the required information to make the correct decisions and navigate safely to its destination; several algorithms have been created in order to satisfy these components of autonomous vehicles. In 2008, Dr. Mohamed Aly published a landmark discovery; his algorithm for lane detection has been referenced or used by several other colleagues and professionals in this field. This study will document another attempt to further improve Dr. Aly's original procedure for lane detection by first, transforming the images to the YCbCr model and using the intensity channel for the edge detection process which is expected to provide better contrast than the red channel in the RGB model that Dr. Aly used; therefore, it will facilitate the edge detection process of the lane marks. Secondly,

extending the work of Dr. Aly to be compatible with different datasets besides the original dataset utilized. Finally, incorporating vehicle and road signs detection features to the package in order to add another important function towards the autonomous car project.

FUNCTIONAL REMODELING OF SUBTYPE-SPECIFIC MARKERS SURROUNDING IMPLANTED NEUROPROSTHESES
Joseph Salatino (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 266
Mentor(s): Erin Purcell (Biomedical Engineering / Electrical & Computer Engineering)

Implanted microelectrode arrays in the brain ("neuroprostheses") provide a unique opportunity for studying and treating neurological injury and disease by directly recording or modulating neuronal activity. However, suboptimal integration with the brain has been reported, where loss of neuronal density and glial encapsulation plague long-term devices (Biran 2005). However, evidence of a direct correspondence of these observations to functional outcomes remains incomplete. Here, we investigate the hypothesis that cell type-specific remodeling may occur in partnership with the prototypical neuronal loss and glial encapsulation surrounding chronically implanted neuroprostheses. Non-functional, single shank microelectrode arrays (Neuronexus) were implanted in the primary motor cortex of adult female Sprague-Dawley rats (Charles River) for predetermined timepoints (3, 7, 28 days), where brains were fixed with paraformaldehyde, sectioned, stained using immunohistochemistry, imaged with an Olympus Fluoview 1000 Confocal Microscope, and analyzed using a BMW custom-modified MATLAB script adapted from (Kozai 2014). Antibodies were chosen to study excitatory/inhibitory drive (VGLUT1, VGAT, GAD67) and subtypes of glia (GFAP, NG2). We report local changes in excitatory/inhibitory marker expression at the tissue-device interface, with relative elevations in inhibitory synapse expression at 28 days, as well as unexpected effects in a unique subset of encapsulating glia. Taken together, these results support the hypothesis that local shifts in the excitatory/inhibitory input at the device-interface, combined with shifts in glial densities encapsulating the array, may contribute to the reported instability in recording quality over time, which may inform new strategies for improving the long-term performance necessary for clinical and research applications.

ANALYSIS FOR LOCATION SPECIFIC WIRELESS TRAFFIC
Nicholas Strawn (Virginia State University)
Category & Time: Electrical and Computer Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 268
Mentor(s): Subir Biswas (Electrical & Computer Engineering), Yan Shi (Electrical & Computer Engineering)

With the exceptional growth of the internet over recent years, analysis and monitoring of wireless traffic have been crucial towards the fundamental knowledge in understanding large networks. WiFi allows connectivity between electronic devices on a wireless network to happen, thus enabling a communication to be establish amongst devices. Globally, there are 14 wireless channels designated to the aforementioned devices, which serve as an environment for sending or receiving data. Focusing on wireless traffic being sent across a network, referred to as "packets", sheds insight on the type of data that may be accessed. Although the data is encrypted for privacy protection, general information can be collected by analyzing the packets dispersed across various wifi channels. Developing a traffic analysis architecture for location-specific wireless traffic will be the driving force for conducting this research. In order to analyze the traffic, a software by the name of Acrylic Wifi Professional, will be used to filter through the various channels on the wifi network. A D-Link DWA-110 Wireless-G USB Adapter will be used to connect directly to the laptop, allowing all the devices within range of the wireless network to appear on the Acrylic software. The tool will be used to sniff wifi packets for data from a device such as a cell phone or laptop. From there we can understand which protocols are being used specifically for the wifi packets, as well as the applications and class. Creating a C language script inside of Acrylic that scans all the channels and grabs specific ones that the user wants to inspect will help aid the development of the tool. Subsequently, a graph can be created from the data to display the traffic packages that are obtained from the tool.

IMPROVED QUANTITATIVE ANALYSIS OF THE TISSUE RESPONSE TO NEUROPROSTHESES USING MATLAB
Bailey Winter (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 269
Mentor(s): Erin Purcell (Electrical and Computer Engineering)

Inserting a microelectrode array in neural tissue elicits a reactive response that changes the composition of the tissue surrounding the electrode. Using fluorescently-tagged antibodies that target cell type-specific markers, an estimation of the composition of the tissue can be made based on the intensity of luminescence. These changes can be assessed as a function of distance from the device interface by binning average intensity values within discrete area increments. This process can be automated using MATLAB to analyze imaged tissue samples; however, the currently available open-source program used in our lab (Kozai 2014) was limited in several aspects. Firstly, the program only allowed for rectangular bins to be used to analyze tissue, resulting in interfacial regions of tissue being excluded from analysis. Secondly, in terms of image requirements, the only acceptable image format is a monochrome TIFF image of each individual color channel, which was time consuming to acquire. Additionally, the program itself was not as user-friendly as it could be and was set up in such a way that increases the chance of user error. To increase the accuracy of the analysis, the program was rewritten to allow a user to first select an origin for the injury site and then outline the injury by hand. A line is calculated from each point on the outline to the origin, and the bins are created by increasing the distance along that line by a user-entered length. To reduce the amount of time needed to acquire the images, the program was restructured to allow for a single TIFF image that contains all color channels. These channels are then separated within the program itself before analysis. All options that affect the program's function are now placed in dialog prompts that are autopopulated with default settings to make the system more user-friendly, decrease the chances of an input error, and reduce run time. Additionally, the capabilities of the program have been expanded to include cell counting. This includes a manual version, in which the user clicks on each cell within a bin, and an automatic version that count the number of objects within a binary image. These improvements have expedited image processing and analysis, facilitating improved throughput of quantitative analysis of the tissue response to neuroprostheses conducted by our lab.

3D PRINTING OF SHAPE MEMORY POLYMER USING THE FUSED DEPOSITION MODELING METHOD
Lucas Wolfe (Michigan State University), Yue Chen (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 4, 2:30 PM - 3:45 PM

Poster: 270
Mentor(s): Xiaobo Tan (Electrical Engineering)

Smart materials have many applications including their use in smart actuators, which can produce mechanical deformation upon stimuli in the form of heat, magnetic fields, or electric fields. The fabrication of these smart actuators can be a tedious and expensive process. The goal of this research is to develop a way to easily and inexpensively fabricate smart actuators via 3D printing using the fused deposition modeling method (FDM). FDM is the cheapest and most user-friendly method for 3D printing of common plastic materials. FDM 3D printing works by melting a filament of desired material and extruding it onto a printing surface where it cools into a hardened state to create solid 3D objects. One challenge associated with the 3D printing of smart materials via the FDM method is that the smart materials must be shaped into a filament that is compatible with FDM 3D printers and can also be melted at a temperature lower than 300ºC without destroying key material properties. We take shape memory polymer (SMP) as a case study in this work. SMP is a polymer smart material that achieves different shapes when heated to certain temperatures. A Prusa i3 FDM 3D printer is adopted in this work because of its capability to print using two extruders that extrude separate materials. If SMP can be printed using a FDM 3D printer, then a dual extruder printer can be used to quickly print smart actuators that are composed of multiple materials. Findings from the experimental explorations are reported.

DESIGN AND PROTOTYPING OF A HIGHLY MANEUVERABLE UNDERWATER REMOTE OPERATIONAL VEHICLE (ROV)
Hanchen Xie (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 271
Mentor(s): Xiaobo Tan (Electrical & Computer Engineering)

The goal of this project is to design an underwater remotely operated vehicle (ROV) with high maneuverability. The vehicle is also designed with its modularity in mind, to facilitate future modification and sensor installation with ease. With three brushless motors (as thrusters) each mounted on a servo motor, the ROV is able to achieve one translational and three rotational degrees of freedom, the combination of which enables the robot to travel to any location and achieve any atttitude. To enable ease of upgrade or addition of more propulsion units, the vehicle also features two MIL SPEC waterproof connectors on the control box. The MIL SPEC connectors used are rated to 13 amps, providing ample buffer for higher powered motors as well. Experimental results on the testing of the developed robot are presented.

SIMULATION AND ANALYSIS OF MICRO-LENS-COUPLED LED
Tian Xie (Michigan State University)
Category & Time: Electrical and Computer Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 272
Mentor(s): Xiaopeng Bi (Electrical & Computer Engineering)

In this poster, the process of using the software to simulate and analyze the Micro-Lens-Couples LED will be demonstrated and the simulation result will be used to fabricate the real device. The software is named Tracepro from Lambda Research Corporation. This poster will be related to the application of light device and LED, the research of optogenetics, and neuroscience. The Micro-Lens-Couples LED will be put in the brain of rat and stimulate the brain. And the result shows that how the simulation result is employed to assemble the optimized Micro-Lens-Couples. The optimized model of Micro-Lens-Couples LED will increase 80% power percentage compared with the bare LED. The result satisfies the expect of experiment.

ENVIRONMENTAL SCIENCE AND NATURAL RESOURCES

CHILDREN'S VISUAL EXPOSURE TO 'BLUE' SPACES IN NEW ZEALAND – THE WHEN, WHERE, WITH WHOM AND HOW MUCH
Ross Bottomley (Michigan State University)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 275
Mentor(s): Amber Pearson (Geography)

Visual exposure to blue spaces has been associated with lower psychological distress in adults. Quantifying visual exposure to blue space is a new line of research – yet, it currently is limited to estimates for exposures at home only and does not capture exposures at other locations or routes used (e.g. during commute) or differences across days of the week. Furthermore, such quantifications reflect potential visual exposure – and very little is known about actual visual exposures. Since measuring actual visual exposure to blue spaces requires information about each respondent's daily activities along with geographic data about those spaces, such information may be costly or timely to obtain. This study makes use of photographic and GPS data collected over a four-day period on children, as part of a large study in New Zealand, called KidsCam. The intent is to understand the nature and extent of children's actual visual exposure to blue space in their everyday lives. By understanding the context, activities, and social dimensions of exposure to blue space we may be better at promoting the mental health benefits of visual exposure to blue space. Specifically, this study aims to: 1) quantify visual exposure to blue space throughout daily activities using photographs – noting intentional versus incidental exposures; 2) compare the quantities of visible blue space observed at home locations compared to elsewhere; 3) compare the quantities of visible blue space observed during week days compared to the weekend; and 4) compare social contacts with whom these visual exposures were shared.

CULTURAL CONSENSUS MODELING IN THE FLINT WATER CRISIS
Antonio Clarke (Michigan State University)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 276
Mentor(s): Steven Gray (Community Sustainability)

In 2013, the city of Flint switched its water source from Detroit to the Flint River. The Flint River water allowed lead and other harmful toxins to be exposed to the many residents of Flint. Resulting in a state of emergency being called on the city of Flint. This gained the attention of both national and international news, causing media and researchers to rush to the city. The main focus was on how this happened and how can the lead exposure be fixed, leaving the voices of the residents who have been physically and psychologically traumatized unheard. In order for the city of Flint to move forward, the voice of the residents needs to be considered. Although it is unclear whether or not residents, government officials, community organizations, and emergency responders share the same ideas or thoughts on what happened. With this research we hope to push the voice of the community to the front so that their point of view is acknowledged and can help with future solutions. To do this we will be chronicling the interactions of residents, government officials, emergency responders, community organizers, and researchers as they negotiate the causes, consequences and solutions through community based modeling. We will also be looking at the role community based modeling has and identifying its costs and benefits. The residents of Flint are directly impacted by what has happened and we hope that through our research we will be able to include the community members in the solution process.

DEVELOPING A CODING RUBRIC FOR STUDENTS' CONCEPTIONS ABOUT ENERGY TRANSFERS DURING DECOMPOSITION
Justin Gambrell (Michigan State University)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 277
Mentor(s): Andy Anderson (Teacher Education), Emily Scott (Teacher Education)

It is important to have an effective rubric when categorizing student responses. An effective rubric is one that is concise, yet encompasses a range of possible answers students might record. In this poster I will present a new scoring rubric that will be used to score students responses to a question about energy transfers during decomposition. This rubric will be based on a learning progression framework, which categorizes student responses into different levels of comprehension. To develop the rubric, I analyzed 250 middle and high school student responses to the question: a mushroom is part of a fungus that needs energy to live and grow. How does it get its energy? I will read these responses, put them into different categories, and then generalize these categories into concise codes so that if someone were to use this rubric in respect to the mushroom energy question, they could correctly code any response with my rubric. This research is part of the Carbon TIME project (Carbon: Transformations in Matter and Energy), where students are taught to use the principles of matter and energy conservation to understand carbon-transforming processes, like decomposition.

MAPPING NUTRIENT LOADING FROM SEPTIC TANKS IN THE GREAT LAKES BASIN
Quercus Hamlin (Michigan State University)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 278
Mentor(s): Anthony Kendall (Earth & Environmental Sciences)

Nutrient loading of phosphorous and nitrogen to the landscape has become a major problem for waterways including in the Great Lakes Basin. Our goal is to create a spatial model for landscape nutrient loading across the Great Lakes Basin. One significant source of nutrient loading is septic tanks. Septic tanks are onsite sewage treatment facilities used mostly in rural as well as small towns and suburban areas not yet connected to city sewage system. In order to estimate where nutrient loading from septic tanks is occurring, the location of septic tanks is required. However, maps of septic systems are not available for states or provinces in the Basin. We sought to create such a map using census information, water well records, and wastewater treatment plant (WWTP) boundaries. These boundaries are not available for most municipalities, and when working at the scale of the Great Lakes Basin they cannot be procured efficiently. In order to locate septic tanks, we created an automated GIS routine to identify at the census block level whether a given block is serviced by a WWTP or using septic tanks. Nutrient loading will be estimated at the block level by giving loading values based on the number of septic tanks and average household size to blocks outside WWTP boundaries. This will be one input to a landscape model of nutrient loading in the Great Lakes Basin.

IRRIGATION IN THE HIGH PLAINS: ASSESSING THE ACCURACY OF REMOTELY SENSED DATASETS
Jeremy Rapp (Michigan State University)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 279
Mentor(s): Anthony Kendall (Geology)

As future climatic conditions become a focal point of policy within the United States a better understanding of hydrologic budgets will be critical. Water usage is a major component of the hydrologic budget across the US. The biggest part of this water usage being irrigation. One of the most heavily irrigated regions in the US overlies the High Plains Aquifer (HPA). The HPA is the largest aquifer system in the US, covering portions of eight states, and primarily used for agricultural irrigation. The only nationwide maps of actual irrigated field locations have been produced using remotely sensed data at a 250 meter cell size. Together, maps for 2002, 2007, and 2012 make up the Moderate Resolution Imaging Spectroradiometer Irrigated Agriculture Dataset (MIrAD-US). The creators of the MIrAD-US dataset have validated it within California and portions of the Great Plains states. However it is important to consistently validate and analyze these remotely sensed datasets across the entire High Plains Aquifer region using current aerial imagery. Creating a reliable validation dataset over such a large region presents significant challenges. Here, randomly distributed points were generated within agricultural land uses of the 2011 National LandCover Dataset. These points were manually classified as irrigated/non-irrigated, and used to assess accuracy and error of the 2012 MIrAD-US dataset. These statistics serve as an important tool in ensuring that the datasets that may be influential on future policy regarding consumptive water uses are accurate and representative of current conditions.

METHYLMERCURY INDUCED LEARNING IMPAIRMENT AND ITS IMPACT ON LARVAL FISH FORAGING AND SURVIVAL
Shanley Roach (College of Saint Benedict)
Category & Time: Environmental Science and Natural Resources, Section 1, 1:00 PM - 2:15 PM
Poster: 280
Mentor(s): Lori Ivan (Quantitative Fisheries Center), Cheryl Murphy (Fisheries & Wildlife)

Sub lethal levels of methylmercury (MeHg), a well-established neurotoxicant, are able to directly impact larval fish cohort survival through alterations of individual behavior. In order to forage efficiently, larval fish must learn to target energetically efficient prey. A larval fish that spends large amounts of energy on failed predation attacks or energetically inefficient prey exhibit a slower growth and reduced survival. The goal of this project was to determine if MeHg exposure impairs a larval fish's ability to learn which prey items to favor and which prey items should be avoided in order to maximize foraging efficiency. To test this hypothesis, a learning algorithm was added into the foraging subroutine of an existing individual-based model (IBM). The algorithm was parameterized using experimental data obtained from learning assays conducted on larval zebrafish (Danio rerio), which provided information about total consumption, time spent foraging, failed foraging attempts, and handling time. The model tracks X number of fish from the day they hatch through day 100. Each day, individuals forage, grow, and experience starvation as well as predation mortality. At the end of the 100 days, the model shows how many fish survived, succumbed to starvation, and succumbed to predation. We ran the model under scenarios with and without incorporating the learning algorithm to determine whether impairments in learning significantly impacted overall cohort survival. Analyzing and comparing output data is expected to show dose-dependent changes in cohort survival and population dynamics as a result of individual behavioral changes.

EPIDEMIOLOGY AND PUBLIC HEALTH

DEPRESSION AMONGST COLLEGE STUDENTS CONSUMING ALCOHOL
Dukernse Augustin (Michigan State Univercity)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 282
Mentor(s): Jim Anthony (Epidemiology & Biostatistics)

Background: Approximately 30% percent of college students have depression in college. For example, one study published has shown that more than 1,825 college students between the ages of 18-24 die each year from alcohol related unintentional injuries. More than 599,000 students between the ages of 18-24 sustain unintentional alcohol related injuries each year (NIAA 2016). The importance of this research is to be able to assist college students that are exposed to depression which leads to alcohol onset. The study aims to analyze whether depression increases the risk of alcohol consumption among college students. We hypothesize a positive relationship between depression and alcohol onset.
Methods: Estimates are from the US National Survey on Drug use & Health (NSDUH), 2002-2014, (N= 60,000). The data are cross sectional surveys with large multi stage sampling designs.
Results: The estimated odds ratio is x.x
Conclusions: The results of this study will not only shed light on depression leading to alcohol onset, but will also further help Epidemiology and Public Health with their knowledge within this particular study.

HIGH PREVALENCE OF ASTHMA AND OBESITY AND THEIR DETERMINANTS AMONG CHILDREN ENROLLED IN MICHIGAN MIGRANT HEAD START PROGRAMS
Nabila Farabi (Michigan State University College of Human Medicine)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 283
Mentor(s): Elahe Crockett (Medicine), Sujin Song (Food Science & Hum Nutrition), Won Song (Food Science & Human Nutrition)

Background: Increasing prevalence of asthma in the US children has become a public health issue. Asthma, a chronic lung disease, causes airway inflammation and narrowing. African American and Hispanic children are at higher risk of asthma compared to other populations, with one of the known determinants being low socioeconomic status. No study has examined the prevalence, comorbidity and determinants of asthma in children enrolled in Michigan Migrant and Seasonal Head Start (MSHS) Programs. MSHS provides comprehensive early childhood education to children (0-5 y) of Migrant and Seasonal Farm Worker families. The aim of this study is to compare the prevalence of asthma with other diseases for which the children received treatment, evaluate its association with obesity and identify determinants. Method: Information about a total of 905 children between the age of 0 and 6 years were accessed through the 2012-2013 ChildPlus Dataset collected by MI Telemon, Inc. The dataset contained information about children from all 18 MSHS centers in Michigan. Results: Preliminary findings suggest a significantly high prevalence of asthma among MSHS children compared to other diseases including anemia, hearing disability, vision impairment, and high lead level and a significantly higher prevalence of asthma among MSHS children with no health insurance compared to MSHS children with health insurance. The data is currently under further review/analysis using IBM SPSS Statistics 20 and will be discussed during presentation. Support: N.F is a REPID scholar, supported by NIH-5-R25 HL108864 award to Dr. Elahe Crockett, REPID Program Director.

ARE TOBACCO POLICIES ASSOCIATED WITH AGE ON SET?
Eric Glass (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 284
Mentor(s): Jim Anthony (Epidemiology)

Background: In 1992, Congress passed the Synar amendment aimed at limiting adolescent access to tobacco. Prior literature states that scientifically the average human's brain is not fully developed until the age of about 20 years old. Therefore, smoking is much more detrimental for adolescents as compared with adults. Our main aim is to analyze the association between the institution of the above mentioned policy amendment and the distributions of the age of onset of tobacco use.
Methods: The data are from the US National Survey on Drug Use and Health (NSDUH), 1979-2014 (n=55,000). The study has a cross sectional design. We compare the confidence intervals for each year to the year 1992, looking for a downward trend in the data after the institution of the policy, causing the median age to increase beyond 18 years old.
Results: I expect the data to have a downward trend in the amount of adolescence (12-18) tobacco usage. The median age will gradually shift higher into the age group of adults and away from the adolescence age group of (12-18). I predict that the data will not have a noticeable change in data until about 1996. It's going to take time for the policy to set in and gain full effect.
Conclusion: Regardless of my results this study will help increase the knowledge in the field of public health pertaining to policies.

ESTIMATING THE RISK OF ALCOHOL USE ONSET SOON AFTER ONSET OF CANNABIS USE
Villisha Gregoire (University of the Virgin Islands)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 285
Mentor(s): Jim Anthony (Epidemiology)

Background: Alcohol is the most commonly used legal drug in the United States (US), while cannabis is the most commonly used illicit drug. Despite preventative efforts over the years, alcohol drinking continues to be a problem in the US. Hasin (2013) postulated that since the passage of the medical cannabis law there has been an increase in cannabis use across the US. In this study we aim to determine whether cannabis use changes alcohol use using the epidemiologic case-crossover design in which cases serve as their own controls.
Methods: Estimates are from newly incident alcohol and cannabis users (n= 855), whose month and year of first use are known from the US National Surveys on Drug Use and Health (NSDUH), 2002-2014. NSDUH annually assesses non-institutionalized US residents aged 12 years and older. For the case-crossover analysis we used the month prior to the month of alcohol onset as the 'hazard' interval, while two months prior to the month of alcohol onset served as the 'control' interval. The association is measured by the odds ratio obtained using the McNemar's test of matched data.
Results: There were 521 newly incident alcohol users who started using cannabis during the hazard interval and 334 who started using during the control interval, respectively. The estimated odds ratio is 1.6 (95% CI: 1.4, 1.8).
Conclusions: We found evidence that cannabis use changes alcohol behavior. Future research might seek to probe into the association between cannabis and alcohol with a focus on whether cannabis use increases the frequency of alcohol use.

SYSTEMATIC ANALYSIS AND EVALUATION OF FEDERAL NUTRITION EDUCATION PROGRAMS
Kaitlyn Moorhead-Hill (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 286
Mentor(s): Elahe Crockett (Medicine), Won Song (Food Science & Human Nutrition), Sujin Song (Food Science & Human Nutrition)

About 15% American households are food insecure. The rate of overweight/obesity (OW/OB) with comorbidity is 32% higher in food insecure households than in food secure households. To meet the basic needs of low-income households, the US government offers several food assistance and nutrition education programs. Aim: To examine the goals, delivery, content, reporting, and efficacy of federal nutrition education interventions. Published literature was reviewed systematically through MSU library's SearchPlus search engine to examine efficacy of the programs. The programs' national impact reports were analyzed for similarities and differences across programs. Results: Expanded Food and Nutrition Education Program (EFNEP) reported improving diet and nutrition and making an impact through food savings, food safety, and physical activity, but not achieving MyPlate recommendations. Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC) enhanced breastfeeding rates and normal growth rates in infants and children, increased food security, and increased intake of low-fat dairy, whole grains, and fruit. Supplemental Nutrition Assistance Program-Education (SNAP-Ed) did not have national impact data available. Conclusion/Implications: The federal programs have similar goals to improve the health of participants and should work more closely together to make referrals to other federal programs in order to improve nutrition-related health outcomes. Support: K.M. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

DESCRIPTIVE ANALYSIS OF CLINICAL PREDICTORS AND QUALITY OF PREHOSPITAL HEMORRHAGIC STROKE CARE
Christian Negron (Cleveland State University)
Category & Time: Epidemiology and Public Health, Section 1, 1:00 PM - 2:15 PM
Poster: 287
Mentor(s): Mat Reeves (Epidemiology & Biostatistics)

Current procedures in emergency medical services (EMS) provide measurements to promote early response to stroke recognition. A descriptive analysis of patient demographics and clinical outcomes in a prehospital setting such as EMS was performed, using a prospective cohort of hemorrhagic stroke patients. Clinical predictors from the American Stroke Association were used to assess the relationship between prehospital activation and stroke recognition with in-hospital stroke response and care. Limitations include sampling size of N=73 and normality distribution parametric.

IMPACT OF OFFICE-GAP PROGRAM ON PATIENT SATISFACTION AND CONFIDENCE IN DECISION MADE
Daniel Nguyen-Tran (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 290
Mentor(s): Elahe Crockett (Medicine), Saman Kandola (Human Medicine), Esha Kumar (Human Medicine), Adesuwa Olomu (Human Medicine)

Shared Decision Making (SDM) is a process that allows patients and their physicians to make a health care decision together. Both patients and their physicians take into account the best treatment available that would be beneficial for the patient. Objective: Determine the reliability of Office-Guidelines Applied in Practice (GAP) intervention and evaluate the impact of SDM on patients' health over time. Method: Office-GAP program was designed to improve prevention and treatment of patients with diabetes and heart diseases for minorities and low-income populations in Michigan Federally Qualified Health Centers (FQHCs). The "Combined Outcome Measure for Risk communication And treatment Decision making Effectiveness" (COMRADE) survey was used to assess the patients' satisfaction with their physician communication. COMRADE is used to measure patients' satisfaction with physician communication and patient confidence in decision made. The survey which consist of twenty questions is given at the initial group visit (pre-GAP) and at two post-GAP visits (3,6 months). All twenty questions use a Likert response format (1=strongly disagreed to 5= strongly agreed). Research assistants explained the questions and helped only patients with limited literacy to complete the forms at each visit. Results and Conclusion: We have successfully collected some data that are currently under review and analysis, and will be presented at the MID-SURE Presentation. We anticipate that our results may provide a rationale for a better health care for patients. Support: D.N-T. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

CHANGES IN VO2MAX AMONG PHYSICALLY ACTIVE MIDDLE-AGE ADULTS OVER A 24-WEEK CYCLE ERGOMETER INTERVAL PROGRAM
Ashley Schneider (Michigan State University), Alex Smith (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 292
Mentor(s): Deborah Feltz (Kinesiology), Christopher Hill (Kinesiology), James Pivarnik (Kinesiology), Ashley Triplett (Kinesiology)

Little is known about how and if healthy adults are able to maintain aerobic fitness in space. Preliminary data must be obtained from earth-based studies designed to determine the most efficient way for adults to increase and/or maintain aerobic fitness. PURPOSE: To determine if participation in an exergame cycling program has an effect on aerobic fitness (VO2max). METHODS: Participants completed a 6-day/wk exercise program on a cycle ergometer for 6-months. Participants were healthy adults (M age=46.9, SD=7.4, N=19) who self-reported participating in at least 30 minutes of vigorous exercise, 3 times/wk. Participants exercised 6 day/wk, using routines developed by Ploutz-Snyder that consisted of (a) 30 min continuous aerobic cycling at or above 75% of maximum heart rate (HRmax), (b) long, 4x4 min intervals at or above 90% HRmax with 3 min active rest, (c) medium 6x2 min intervals at 70%, 80%, 90%, 100%, 90%, 80% of HRmax, respectively with 2 min active rest, and (d) short, 30 sec max sprint intervals with 20 sec active rest. Outside lab physical activities were tracked and recorded, and participants did not report strength training during the study. VO2max was measured pre, mid, and post intervention. RESULTS: Average VO2max increased from pre to mid-test (34.3 ml/kg/min vs. 39.1 ml/kg/min), but did not change from mid to post-test (39.1 ml/kg/min vs. 39 ml/kg/min). CONCLUSION: Exergame interval training appears to be viable for increasing VO2max over 6-months of training for healthy, middle-aged adults.

THE ASSOCIATION AMONG MATERNAL AGE AND EDUCATION LEVEL AND RISK FOR CEREBRAL PALSY IN OFFSPRING
Andrea Siguenza (University of Central Florida)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 293
Mentor(s): Madeleine Lenski (Epidemiology & Biostatistics), Nigel Paneth (Human Development)

Cerebral Palsy (CP) is characterized as a neurological condition arising from brain injury during prenatal or postnatal early development that affects the control of motor function. Diagnosis for the syndrome occurs during infancy and early childhood. Approximately one out of every five hundred school aged children has been diagnosed with the condition and the prevalence of CP has remained stable for around forty years. For every new case of CP in the United States, there is an estimate of lifetime direct and indirect costs of approximately one million dollars. Trauma and asphyxia related to birth have traditionally been associated with CP, but current research suggests such complications occur in only a minority of CP cases.The purpose of this research project was to identify preventable risk factors of CP particularly related to maternal correlational variables during onset of pregnancy. The prime variables of interest were maternal age, maternal education level, marital/economic status and their association with risk of CP in children. Using the data collected from the Origins, Wellness and Life History in CP (OWL) project, descriptive statistics were analyzed and reported alongside Odds Ratio and linear regressions in order to observe if a statistically significant association exists between maternal age and education level and risk for CP. If we are able to identify preventable risk factors for CP then we may be able to design interventions that can prevent this common and often severely disabling condition.

CHANGES IN MUSCULAR STRENGTH OVER A 24-WEEK CYCLE ERGOMETER INTERVAL PROGRAM
Alexander Smith (Michigan State University), Ashley Schneider (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 294
Mentor(s): Deborah Feltz (Kinesiology), Christopher Hill (Kinesiology), James Pivarnik (Kinesiology), Ashley Triplett (Kinesiology)

Little is known about how aerobic interval training programs influence muscular strength in healthy adults. PURPOSE: To determine if participation in an aerobic interval exercise program could lead to muscular strength gains. METHODS: Participants completed a 6-day/wk exercise program on a cycle ergometer for 6-months. Participants were healthy adults (M age=46.9, SD=7.4, n=19) who self-reported participating in at least 30min of vigorous exercise, 3 times/wk. Participants exercised 6 day/wk, using routines developed by Ploutz-Snyder consisting of (a) 30min continuous aerobic cycling at or above 75% of maximum heart rate (HRmax), (b) long, 4x4min intervals at or above 90% HRmax with 3min active rest, (c) medium 6x2min intervals at 70%, 80%, 90%, 100%, 90%, 80% of HRmax, respectively with 2min active rest, and (d) short 30sec max sprint intervals with 20sec active rest. Outside lab physical activities were recorded, and participants did not

report strength training during the study. Isometric knee strength (45deg, 5sec contraction) including Peak Torque Extension (PTE) and Peak Torque Flexion (PTF), was measured on the right leg before and after the 6-month training program using the Biodex 3 dynamometer. A dependent t-test was used to evaluate pre to post differences in outcomes of interest. RESULTS: PTE increased significantly ($p<0.03$) from the pre to post-test (92.67±28.53ft/lbs vs. 102.19±29.02ft/lbs). PTF did not differ statistically from pre to post-test (61.59±18.62ft/lbs vs. 60.34±21.98ft/lbs). CONCLUSION: Interval training appears to be an option for increasing some measures of muscular strength over a 6-month training period.

DIFFERENCES IN GAIT SPEED AMONG ADULT COMMUNITY MEMBERS.
Alexi Vasbinder (Michigan State University)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 295
Mentor(s): Kendra Kamp (Nursing), Barbara Smith (Nursing)

Chronic conditions and their treatments produce a variety of symptoms, which can affect an individual's physical function. Gait speed has been shown to be an effective measure for assessing functional status and predicting poor health outcomes such as physical and cognitive declines, falls, hospitalizations, and mortality. Most studies that have examined gait speed in the general population used healthy adults to determine baseline data. The purpose of this study is compare normal and fastest gait speeds between healthy adults and adults with two or more chronic conditions. A total of 40 participants were recruited for the study. Participants were asked to walk 16 feet three times at their normal pace and three times at their fastest pace. Gait Speed was measured using the GAITRite®, an instrumented walkway that uses pressure sensors to detect gait parameters. Results showed no difference between gait speed and age for normal walking speed ($p=0.234$), however there was a significant decline with age for fastest walking speed ($p=0.015$). The results also showed a significant difference in average walking speeds between healthy individuals and those with two or more chronic conditions for fastest walking speed ($p=0.042$). These results indicate the importance of assessing fastest walking speed since fastest walking speed may better predict poor health outcomes. Interventions could be developed to improve gait speed and reduce the possibility of negative consequences.

INVESTIGATING NEUROMUSCULAR CONTROL OF THE HIP IN ACL RECONSTRUCTED AND CONTROL PARTICIPANTS.
Martin Weaver (Saginaw Valley State University)
Category & Time: Epidemiology and Public Health, Section 2, 2:30 PM - 3:45 PM
Poster: 296
Mentor(s): John Popovich Jr (Osteopathic Surgical Specialties)

ACL injury affects approximately 200,000 people in the United States annually. About 75% of ACL injuries occur in a non-contact fashion disproportionately affecting females 5 to 8 times greater than males. Non-contact ACL rupture occurs during sharp pivoting and deceleration maneuvers. Often during the injury, the knee is placed in a biomechanically stressful alignment. During a non-contact ACL injury, the knee is often forced into valgus as the trunk is displaced laterally and the hip is adducted and internally rotated. Studies have demonstrated that subjects with poorer neuromuscular control of the trunk have a higher risk for ACL injury as they are more likely to allow the knee to enter this high-risk alignment. While neuromuscular control and alignment of the trunk and spine is fairly well understood with regards to ACL injury, control and motion of the hip is less well understood during ACL trauma. In this study, we are developing a protocol to measure neuromuscular control of the hip using force and position tracking as well as reflexive muscular response to a sudden release of force in ACL reconstructed and control participants. Results from the experiment could be important in developing screens to identify athletes at risk for ACL rupture and improve preventative exercise protocols. Because knee valgus and hip and trunk control are implicated to be important factors during non-contact ACL rupture, we hypothesized that subjects with a history of ACL rupture will have poorer control and strength of the hip than do control participants.

INTEGRATIVE BIOLOGY

THE DRAGONFLY: NATURE'S GUIDED MISSILE
Patricia Aguiar (Princeton University)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 300
Mentor(s): Greg Gage (Neuroscience)

The dragonfly can capture its prey mid-air with a 95% accuracy rate. What biological equipment does the dragonfly have that allows it to do this amazing feat? To examine this very question, I will be replicating Paloma T. Gonzalez-Bellido's 2012 PNAS paper using DIY open source tools. Gonzalez-Bellido found that there are neurons that run from the dragonfly's compound eyes to its wings that help the dragonfly track and catch its prey with such accuracy. My version of this experiment will control a laser using a laser-light show set up (instead of a expensive custom-made projector) that shines a laser dot (representing a fly) as the stimulus. I will simultaneously be recording on open source bio-amplifiers the activity from these target selective neurons as the dragonflies watches its "prey" move across a screen. The results from this experiment affirm that the TSDNs (the target-selective descending neurons) are motion sensitive and that they encode a population vector, allowing the dragonfly to track and capture its prey with such amazing accuracy.

NEUROTRANSMITTER INDUCED VASOCONSTRICTIONS IN HIGH FAT AND LOW FAT DIET FED RATS
Jamie Binns (Talladega College)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 301
Mentor(s): Hui Xu (Pharmacology & Toxicology)

Hypertension or high blood pressure is a commonly diagnosed cardiovascular disorder affecting Americans. Studies have shown links between obesity and hypertension. Obesity associated hypertension is common with increased sympathetic activity; as higher sympathetic activity causes arterial constriction, increases vascular peripheral resistance, and blood pressure. It is hypothesized that rats exposed to a high fat diet may have an increased response to neurotransmitters (norepinephrine or ATP) released from the sympathetic nervous system, when compared to control diet rats. Increased vascular reactivity to sympathetic neurotransmitters may also contribute to obesity associated hypertension. After 20 weeks on a high fat or control diet, mesenteric arteries will be dissected from Sprague-Dawley (SD) strain rats. Arteries will undergo cannulation on two glass pipettes, and pressurized lumens (80 mmHg.) Drug-induced changes in arterial outer and inner diameter will be recorded using Diametrack software. Concentration response curves for norepinephrine and ATP will be plotted and the EC50 values of each drug (the concentration of a drug that gives half-maximal response) will be calculated using prism software.
Results: We expect to find that arterial contractile responses in rats fed high-fat diets will be greater than the responses in control rats fed low-fat dies. Conclusion: If our hypothesis is supported it will provide evidence that increased vascular reactivity to sympathetic neurotransmitter may contribute to obesity associated hypertension.

THE ELECTRIC FISH PIANO
Davis Catolico (Claremont McKenna College)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 302
Mentor(s): Greg Gage (Neuroscience)

The South American weakly-electric fish emits a constant, low-voltage electric field to navigate its environment and communicate with other fish. When in close proximity to another fish emitting a similar frequency, however, both fish are effectively blinded, jamming each other's signals. Depending on the species, either one of both fish will shift their discharge frequencies to increase the frequency difference between them -- known as the Jamming Avoidance Response (JAR). A DIY set-up was developed to replicate the experiment that discovered the JAR (Watanabe and Takeda, 1963). Incorporating an Arduino Zero and a Backyard Brains SpikerShield, it was possible to listen to and record the electrical discharge and to elicit the JAR behavior in the fish. We used the Backyard Brains Spike Recorder application for data analysis. The presence of other electric fish was mimicked by stimulating carbon electrodes. Tests were run on various Apteronotus and Eigenmannia species. With small frequency changes at regular intervals, it was possible to "chase" the fish's frequency to upper and lower limits. Based on a small sample, we determined that each species has a unique frequency range. With this understanding, we set individual fish to specific frequencies using a computer program that continuously recorded the fish and controlled the artificial stimuli. These fish were tuned to mimic the tones of a piano.

USE OF GEOMETRIC MORPHOMETRICS TO DETERMINE IF COYOTES FOLLOW BERGMANN'S RULE
Lauren Cherry (Pennsylvania State University)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 303
Mentor(s): Cybil Cavalieri (Integrative Biology)

Bergmann's rule, which attributes size variation among species to environmental temperatures, has long been accepted as the leading explanation for variation in endotherms. However, there are many exceptions to this rule for some species (Alhajeri et al., 2016; Schiaffini, 2016). Although the rule may apply well between species, it may not apply when considered within a wide-ranging species. The coyote (Canis latrans) is wide-ranging and highly adaptive to different environments which allows analysis of the rules when applied to intraspecific variation. We examined the size and shape of coyote skulls from different regions in North America to determine if the species conforms to Bergmann's rule. Using a geometric morphometric approach, we examined the size and shape of four coyote subspecies populations from the colder Great Lakes region, the western US, and Mexico, both of which have significantly warmer environment. As expected, there was no strong variation between coyote subspecies and no correlation to colder or warmer environments. Northern populations, specifically the Northeastern coyote subspecies, did have slightly longer rostrums and a slightly different shape in the zygomatic arch than the southern populations but that could be due to a number of factors, including hybridization with wolves and dogs (Way, 2013). Coyotes do not follow Bergmann's rule. Since coyotes are able to find resources in all of the environments with existing populations, energy allocation and use are likely to be the same resulting in no variation.

EVOLUTIONARY RELATIONSHIP BETWEEN GECKOS AND ANOLES
Oacia Fair (Michigan State University)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 304
Mentor(s): Travis Hagey (BEACON Center for the Study of Evolution in Action)

Geckos and anoles have strikingly similar toepad shape morphologies, yet it has been determined that anoles independently evolved from geckos. There are numerous variations of geckos' toepad shape such as having wide adhesive toepads, narrow toes and losing toes altogether. We hypothesize that anoles follow the same variations as geckos because they experienced similar evolutionary occurrences. Anolis Onca has an almost identical toe variation as Gecko species Gonatodes due to both lizard species possessing narrowed-toes and lack adhesion. Having the knowledge of this phenomena may allow us to understand if and how convergent evolution occurred. The importance of this is it allows scientists to recognize how evolutionary trends play a role in understanding why distantly related organisms can inherit similar traits and live in similar environments which can be applied to any species. We collected specimens of 45 geckos and 25 anoles to perform our comparative study and used method Geometric Morphmetrics which quantifies and analyzes morphological shape to reject or accept this hypothesis. Computer program tpsDIG2 was used to landmark toe shape and those results will be put into computer program R. Our findings will be put into morphospace with the use of phylogenetic Principal Component Analysis (PCA) to determine how closely related geckos and anoles

toepad shape are. Expected results will show a strong correlation between geckos and anoles having similar toepad shape. We predict that anoles follow the same variations as geckos because convergent evolution occurred..

QUANTIFYING ADHESIVE TOE PAD MORPHOLOGY IN HEMIDACTYLUS GECKOS
Jordan Garcia (Beloit College)
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:15 PM
Poster: 305
Mentor(s): Travis Hagey (BEACON Center for the Study of Evolution in Action)

The biomechanics of gecko toe pad adhesion are becoming increasingly well studied, however, the evolutionary dynamics of this trait are less understood. Hemidactylus geckos are found in the Middle East, Southeast Asia, Africa, South America, Central America, and parts of the southern United States. Comparing closely related species in a genus characterized by great range expansion and adaptive radiation offers an excellent opportunity to examine this trait evolution. To date, the extent of toe morphological consideration beyond biomechanics has been the observation of visibly noticeable differences. Geometric morphometrics can detect minute differences and quantify these observations. We use tpsDig2 geometric morphometrics software to analyze photos of gecko toe pads sampled from live and preserved specimens. We digitize 11 landmarks on homologous areas of the fourth proximal toe of 33 species in the Hemidactylus genus. Floating semi-landmarks are used to detail shape differences between species. We hypothesize that those species found in the arid clade, located in the Middle East, will have distinct morphology that is adapted to the less arboreal environment. Higham et al. (2015) report that adhesive pads are disadvantageous when running on smooth surfaces. We predict that their toes will be longer and have less adhesive area than those species found in forest ecosystems, thus enhancing predator evasion in flat terrestrial environments. Analyzing morphological differences and relating these traits to habitat use would allow us to better understand the influences of ecology and provide a structure for understanding the evolutionary trajectory of morphology in geckos.

PRIMARY CARE PROVIDER ADHERENCE TO VASCULAR NEUROLOGY RECOMMENDATIONS AND RISK FACTOR TARGETS FOR RECURRENT ISCHEMIC STROKE PREVENTION: A QUALITY IMPROVEMENT PROJECT UTILIZING THE ELECTRONIC MEDICAL RECORD
Larissa Georgeon (Michigan State University College of Human Medicine)
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 307
Mentor(s): Elahe Crockett (Medicine), Philip Gorelick (Translational Science & Molecular Medicine)

Stroke is the 5th leading cause of death in the US and recurrent stroke represents almost 25% of all strokes. Stroke and recurrent stroke have well-documented risks and strategies to reduce subsequent risk of an event. OBJECTIVE: Utilize the electronic medical record (EMR) to assess patient care by tracking key recurrent stroke prevention recommendations and quality metrics generated by vascular neurology subspecialists at Mercy Health Saint Mary's Hauenstein Neuroscience Center to primary care providers in the Advantage Health-Saint Mary's Medical Group. HYPOTHESIS: We anticipate that primary care providers will be at or below the average of recurrent stroke prevention targets set by American Heart Association/American Stroke Association (AHA/ASA) in the ischemic stroke and transient ischemic attack (TIA) prevention guidance statement when compared to other major studies. If the recommendations are not being followed or if the metrics are not being met, we will seek opportunities for improvement. METHOD: Develop a data collection case report form to capture information about demographics, risk factors, stroke subtype, and process and outcome guidance metrics for recurrent ischemic stroke prevention according to AHA/ASA. The projected sample size is 100 patients. This will include 50 recurrent ischemic stroke or TIA patients from the NextGen-Cerner EMR interface and 50 from the Athena Production EMR interface. The protocol was approved by the institutional review board. RESULTS: The data is currently being collected and will be discussed in the poster presentation. Support: L.G. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

PRIMARY CARE PROVIDER ADHERENCE TO VASCULAR NEUROLOGY RECOMMENDATIONS AND RISK FACTOR TARGETS FOR RECURRENT ISCHEMIC STROKE PREVENTION: A QUALITY IMPROVEMENT PROJECT UTILIZING THE ELECTRONIC MEDICAL RECORD
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INVESTIGATING HUMAN FREE WILL WITH ARDUINO
Patrick Glover (Northeastern University)
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 309
Mentor(s): Gregory Gage (Neuroscience)

Do humans have inherent free will, or are they just biological machines subject to the same physical determinism as every other animal? Modern neuroscience can provide some insight to these questions, such as Benjamin Libet's famous 1986 experiments that correlate the EEG readiness potential (RP) with a subconscious decision to perform a voluntary action. In summary, before a subject performs a simple voluntary action (e.g. "Flex your wrist whenever you feel like it"), the secondary motor area generates a characteristic buildup of EEG potential over 350 milliseconds before the subject becomes aware that they are going to perform the action. If the brain was already preparing to perform the action for nearly half a second before the individual consciously "decided" to perform the action, did the individual actually decide? In the spirit of open science, anyone should be able to recreate this experiment, both improving the debate with additional data, as well as furthering the general public's understanding of neuroscience. Our project aims to allow the DIY community to participate in the discussion by recreating Libet's experiment using an Arduino Uno, two open source hardware shields, and MATLAB. The RP is extremely small, roughly 1/10th the amplitude of an alpha wave, so visualizing it with a low-budget platform proved to be difficult. The buildup of potential is apparent only through averaging across 100 trials. Initial results are promising, with a fairly consistent wave that matches the shape and period of a readiness potential, but further experimentation is required.

ELECTRIC FISH PROBE
Michael Haag (University of Central Florida)
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 310
Mentor(s): Greg Gage (Neuroscience)

Rivers in Africa are teeming with fish constantly outputting all sorts of electric signals, and these signals can be used to identify the species, each having its own unique signal.There has not been a long-term study on weak electric fish due to the researchers having limited time and needing expensive, heavy equipment. Thus, this project aimed to construct an electric signal detector to map the environment and the behavior of African electric fish, such as their feeding and mating behavior.

A DOG A DAY KEEPS THE STRESS AWAY
Natalie Liogas (Michigan State University), Joshua Jackson (Michigan State University)
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 311
Mentor(s): Erica Wehrwein (Physiology)

Therapy dogs are used in an array of settings for emotional support. We tested the hypothesis that in the presence of a therapy dog, there will be a blunted physiological response to stress. Young, healthy undergraduate students were tested (n=10, 3M, 7F, mean age =20.22), and were prescreened for fear of dogs and dog allergies. Baseline measurements of blood pressure, pulse, and perceived stress rating were taken while subjects were seated. Subjects then performed a standard laboratory stress protocol, once without a therapy dog, and once in the presence of a therapy dog, preceded by 5 minutes of interaction with the animal. Measurements were recorded at the end of the stress protocol for both conditions. Subjects began the second condition once their blood pressure and pulse had returned to baseline levels. All data was analyzed with one tailed paired t-tests. Results from the experiment indicate a significant reduction in MAP in subjects while in the presence of a therapy dog ($p<0.05$). There were no significant differences measured between the conditions for perceived stress level or pulse amplitude. Data trends however indicate an overall reduced physiological response to the stress protocol when in the presence of a therapy dog, despite little change in self-evaluated stress level.

ROLE OF CRH SIGNALING IN THE DORSAL RAPHE ON POSTPARTUM ANXIETY
Karina M Matos (University of Puerto Rico)
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:15 PM
Poster: 312
Mentor(s): Zachary Grieb (Psychology & Neuroscience), Joseph Lonstein (Psychology)

Healthy mother-infant interactions are critical for the socioemotional development of offspring. While motherhood is often associated with elevated mood, many postpartum women experience emotional dysregulation, especially elevated anxiety. Postpartum anxiety is particularly damaging because it perpetuates across generations, with children of anxious parents 5-7 times more likely to be diagnosed with an anxiety disorder than their general counterparts. Therefore, understanding the underlying neurobiology of postpartum anxiety is critical because it has adverse and long-term effects on children. Corticotropin-releasing hormone (CRH) is a neuropeptide involved in stress-related physiology, including stress-related anxiety. CRH causes these effects through modulating serotonergic systems that mediate socioemotional regulation, such as that found in the dorsal raphe nucleus (DRN), which provides most of the forebrain serotonin. There are two known CRH receptors CRHR1 and CRHR2 that have opposing effects on anxiety-like behaviors, with CRHR1 activation anxiogenic and CRHR2 activation anxiolytic, in the DRN of males. Therefore, we hypothesize that CRH expression will be lower in dams showing less anxiety-like behaviors, as CRH signaling is generally associated with anxiety. Additionally, we hypothesize that DRN levels of CRHR1 mRNA will be decreased, while CRHR2 mRNA will be increased, in parturient dams given the role of each receptor on anxiety and dams' lower anxiety levels compared to virgins. To assess the hypothesis we will use immunohistochemistry to examine the relationship between anxiety-like behavior and CRH immunoreactivity in sites with extensive CRH projections to the DRN, and RT-PCR to quantify CRHR1 and CRHR2 mRNA expression in the DRN across reproductive states.

EFFECTS OF HOT PEPPERS ON METABOLISM
Connor McCalmon (Michigan State University), Adrienne Spring (Michigan State University)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 315
Mentor(s): Erica Wehrwein (Physiology)

It has been shown that eating spicy foods can alter metabolic rates. Our project aimed to test the hypothesis that capsaicin may be the active compound causing these changes in energy expenditure. Subject demographics included college aged subjects (n=14, 8M/6F). A baseline of subjects' exhaled gases, heart rate, and skin temperature was taken before ingesting either a puree of hot peppers (treatment) or bell peppers (control). Measurements were repeated thirty minutes after consumption of peppers. Resting energy expenditure (REE) was calculated and data was analyzed using a paired t-test. Change in REE between the baseline and 30 minutes after bell pepper consumption was was unchanged, while the change in REE after hot pepper consumption was significantly elevated ($p<0.05$). REE increased in the control group by an average of 7%, while increasing by an average of 42% in the treatment group ($p<0.05$). Average percent increase was significantly higher in the hot pepper group ($p<0.05$). Heart rate and skin temperature did not change significantly in either group. This allows us to infer that significant increase in metabolism with hot pepper consumption is independent of the sympathetic response to the heart and skin. Capsaicin may be the active compound causing the change. Further studies may be done using intervention methods to control weight, which could lend itself in the worldwide growing problem of obesity.

INVESTIGATING SYLLABI FOR THREE-DIMENSIONAL LEARNING
Claire Morrison (Michigan State University)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 316
Mentor(s): Rebecca Matz (Natural Science)

In 2012, the National Research Council released A Framework for K-12 Science Education. The three dimensions of learning outlined in this framework are Science Practices, Crosscutting Concepts, and Core Ideas. Science Practices describe how scientists conceptualize, carry out, and present their research; Crosscutting Concepts are ideas that exist across disciplines in science and engineering; Core Ideas are central to specific disciplines and can help explain new disciplinary phenomena. The concept of three-dimensional (3D) learning has outlined a new direction for science curriculum development. We have developed a rubric to identify evidence of the three dimensions in biology postsecondary course syllabi, which aligns with a larger effort at Michigan State University to identify 3D learning in postsecondary science courses. Although different instructors might include different types and amounts of information, and syllabi may not fully represent the concepts highlighted in class, they can be a valuable data set. Syllabi are especially useful because they tend to be more easily accessible than observation and exam data and because they are often archived. The syllabus rubric we have developed will allow us to identify changes in syllabi over time and to compare evidence of 3D learning found in syllabi with classroom observation and exam data.

THE EFFECTS OF SEASONALITY ON THE BIOMECHANICS OF PINUS STROBUS
Kwamina Otseidu (Michigan State Univeristy)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 317
Mentor(s): Frank Telewski (Plant Biology)

Following the ice storm on Michigan State University campus in January 2013, we began a survey assessing trees which received damage. We found that White Pine (Pinus strobus) had a higher percent basal area loss than most other tree species surveyed. Using a group of trees with known genetics, we tested branches of these trees for modulus of elasticity (MOE) and modulus of rupture (MOR) using a universal testing machine (UTM) four point bending test; also identifying density and moisture content of branches through other measurements in the winter of 2014. We then completed similar tests for the remaining 3 seasons. We found that in the winter branches had a higher modulus of rupture and modulus of elasticity than summer, fall, and spring.

THE PROTECTIVE EFFECT OF ANG 1-7 IN MECONIUM INDUCED APOPTOSIS OF HUMAN ALVEOLAR EPITHELIAL CELLS (AEC)
Gabriela Peguero (Michigan State University)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 318
Mentor(s): Elahe Crockett (Medicine), Bruce Uhal (Physiology)

Previous work from this laboratory demonstrated that fetal proteolyitic enzymes found in Meconium (MEC) cause detachment of alveolar epithelial cells (AECs) and induce their death by apoptosis. Apoptosis of the alveolar epithelium is mediated by autocrine production of Angiotensin II. It was shown that angiotensin converting enzyme-2 (ACE-2) protects against lung cell apoptosis by limiting the local accumulation of the proapoptotic peptide, ANG II. This is achieved by converting ANG II to angiotensin 1-7 (ANG 1-7), which in addition, blocks apoptosis in response to ANGII. Hypothesis: MEC induces apoptosis of AECs so, supplying these cells with the ACE-2 product, ANG 1-7, will provide protection against MEC-induced apoptosis. Methods/Results: To determine if ANG1-7 protects against MEC- induced apoptosis, 2 day sub-confluent A-549s cells were treated with 2.5% MEC in the presence or absence of ANG 1-7. Propidium iodide staining was preformed to observe nuclear fragmentation to quantify the MEC-induced apoptosis. A significant increase in apoptosis was measured in cells exposed to MEC without ANG 1-7 compared to MEC+ANG1-7 groups. Conclusion: From this data we can speculate that ANG1-7 inhibits MEC-induced apoptosis in the same way it blocks apoptosis in response to other inducers. With this model further research can investigate whether purified ACE-2, as well as it's product ANG 1-7, can be used for innovative treatments against MEC-induced apoptosis in MEC- Aspiration Syndrome (MAS) patients. Support: G.P. is a REPID scholar, supported by NIH-5-R25 HL108864 award to Elahe Crockett, REPID Program Director.

PUMP UP THE JAMS: DOES MUSIC INCREASE METABOLISM WHILE RUNNING?
Rachel Rick (Michigan State University), Lauren Smith (Michigan State University)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 319
Mentor(s): Erica Wehrwein (Physiology)

The effects of fast paced music on physiological processes while running are not as well-known as its psychological effects. This study measured the metabolism of a person running in place while listening to music compared to when having all sound voided. We hypothesized running in place while listening to music will increase caloric expenditure compared to running in place with no music. Healthy subjects who work out more than three times each week (n=8, 6F/2M, ages 18-23) first stood stationary for 3 minutes to obtain a baseline heart rate and respiration rate. They then ran in place for 4.5 minutes to either music or no music (randomized) with a face mask on connected to a gas analyzer. The gas analyzer calculated the amount of CO2 exhaled and the amount of O2 inhaled during their run. These respiratory gases were used to calculate the Resting Energy Expenditure (REE), which was converted to how many calories were burned during each of the conditions. The subjects were given a rest period to return to baseline, then ran again to the opposite condition. The results showed a statistically significant higher average of 4.03 calories burned while running with music versus an average of 3.02 calories burned while running without music ($p<0.01$). These results suggest running with music has physiological benefits, such as increased metabolism, and it may be helpful if implemented into weight loss programs.

INVESTIGATING MECHANISMS OF MAINTAINING DIVERSITY IN FIELD TRIFOLIUM SPECIES
Kamyra Rodgers (Eastern Michigan University)
Category & Time: Integrative Biology, Section 3, 2:30 PM - 3:45 PM
Poster: 320
Mentor(s): Maren Friesen (Plant Biology)

The project focuses on highly diverse communities of the legume Trifolium. The study site consists of 8 native members of Trifolium sp. in 4 sq. meter plots coexisting, with records dating back 8 years. I will explore which factors contribute to species coexistence through plant soil feedbacks by studying the root architecture of coexisting species and presence of symbiotic rhizobial members. Rhizobia in this case, is the bacteria that grows within the nodules on the roots, that form a symbiotic association with the legume obtaining nutrients from the plant and producing nitrogen. This process is called, biological nitrogen fixation. Root architecture would involve measuring, root biomass, length, nodule size and weight as well as soil feedback on different Trifolium species. These characteristics will vary in relation to species differences. For example, if type A is in competition with other type A species, it will result in poor root growth, and little to no nodules when grown together. Whereas, if type A species grew alongside type B species, they will support each other and have a great deal of roots and nodules. This work will yield an integrated insight into the ecological mechanisms of diversity maintenance. The overall goal of the project is to explore if there are trade offs when species coexist with one another, as well as measuring the genetic diversity of rhizobia in nodules of plants growing with different soil conditioning and different soil competitors. These issues have remained a fundamental challenge in the study of biodiversity.

THE EFFECT OF DIESEL EXHAUST PARTICLES ON NEURAL STEM CELLS DERIVED FROM A HEALTHY HUMAN
Rachel Rolinski (Michigan State University)
Category & Time: Integrative Biology, Section 4, 2:30 PM - 3:45 PM
Poster: 323
Mentor(s): Colleen Hegg (Pharmacology & Toxicology)

Environmental air pollutants cause neural inflammation, respiratory illness, and premature death in people living in large metropolitan areas. Diesel exhaust contains a form of air pollution called particulate matter, a mixture of solid and liquid droplets in the air. These particles pose health concerns because they are small enough to enter the lungs and cross the blood brain barrier. However, the influence of particulate matter on human neurons is largely unexamined. Advancements in reprogramming technologies have developed techniques in which mature somatic cells are genetically modified back to a stem cell-like state, called induced pluripotent stem cells (iPSCs). Human iPSCs create new opportunities to explore the effects of environmental toxicants at a cellular level in humans. We hypothesize that diesel exhaust particles (DEP) will decrease the viability of neural stem cells derived from healthy human iPSCs. First we will characterize iPSC cultures looking for markers of stem cells and neuronal progenitors with immunocytochemistry. Then, following a two day exposure of the human neural stem cells to 0-100 µg/ml DEP, cell viability, cytotoxicity and apoptosis will be measured using an ApoTox-Glo™ Assay. We predict that exposure to DEP will significantly decrease cell viability and increase cell death. Further investigation would examine how DEP affects proliferation, neurogenesis, and neural stem cells that are genetically predisposed to Alzheimer's disease in comparison to healthy controls. This would contribute to a greater understanding of the interactions between environmental and genetic factors in the pathogenesis of Alzheimer's disease on a cellular level.

COMPLEX NEURAL TUNING
Nicholas Sabaj (Reed College)
Category & Time: Integrative Biology, Section 4, 2:30 PM - 3:45 PM
Poster: 324
Mentor(s): Mark Reimers (Neuroscience)

Neuroscientists have noted that some cells, specifically in sensory areas, fire more often under some conditions than most. If conditions are varied along one parameter this variation is called the neuron's 'tuning'. However most neurons do not show obvious tunings, and recent work suggests that the tunings of even well-studied neurons may depend in a complex way on several parameters. The aim of this project is to study how overall behavioral state affects tuning of neurons in medial prefrontal cortex (PFC) and hippocampus/entorhinal cortex (ERC) of rats. Our experimental design consists of analyzing data from a collaborating lab (Buzsaki et al) and discovering more complex patterns in the data, building on previous findings. The Buzsaki lab experiment consisted of recording rat behavior in a modified open field test, in which cereal is periodically tossed into the environment in order to prompt the subject's movement around the enclosure. Prior to placement in the open field apparatus, the rat has microelectrodes surgically implanted in the right dorsal hippocampus, to measure electrode voltages and local field potentials (LFPs). In addition, animal location data is provided, which will be analyzed with behavioral measures. Data sets on location and head

motion relative to the electrode voltage and LFP recordings will be analyzed to detect neural tunings related to head turning as well as other high-level behaviors, such as hesitation, path alteration, and feeding behavior.

VARIATION IN COLOR SENSITIVITY AS A RESULT OF LOCAL ADAPTATION IN THREESPINE STICKLEBACK POPULATIONS
Cecilia Schlecht (Michigan State University)
Category & Time: Integrative Biology, Section 4, 2:30 PM - 3:45 PM
Poster: 325
Mentor(s): Robert Mobley (Integrative Biology)

In sticklebacks, it is known that there are four optic cones in the eyes that compose color vision. These cones have peak absorptions at 360, 445, 530, and 605 nm. Being able to see different wavelengths of color is important, as stickleback's mating, foraging, and other activities are visually mediated. Between different populations of sticklebacks, these behaviors differ greatly due to light differences in their habitat. In this study, we aim to find the threshold of each of these optic cones in multiple populations. We are conducting optomotor tests, where we project spinning wheels onto a globe where the fish is being held. Sticklebacks have an innate tendency to follow moving objects in a circular pattern, so a response is attained when the fish follows the moving pattern around the globe. We are studying ancestral marine populations, as well as several lake populations that are known descendants of the marine fish. Foraging and mating behaviors differ between populations, and as a consequence, visual sensitivities might also differ. We are aiming to provide evidence of evolution of visual abilities between marine and freshwater fish, and also environmental differences between lakes.

WHAT IS THE IMPACT OF RACE ON SELF-EFFICACY IN CHRONIC DISEASE MANAGEMENT IN FEDERALLY QUALIFIED HEALTH CENTERS?
Evonte Terrell (Michigan State University)
Category & Time: Integrative Biology, Section 4, 2:30 PM - 3:45 PM
Poster: 327
Mentor(s): Elahe Crockett (Medicine), Adesuwa Olomu (Medicine)

Background: The Office-Guidelines Applied in Practice (Office-GAP) Program was designed to improve cardiovascular care for minority and low-income populations with diabetes/coronary heart disease (CHD) in Federally Qualified Health Centers (FQHCs) in Michigan. Patients with diabetes/CHD are expected to perform daily self-management activities to help avoid diabetes/heart-related morbidity and mortality. Improving patient self-efficacy is a critical pathway to improved self-management. Previous studies have suggested that self-efficacy may be a relevant determinant of self-management behaviors among populations with limited health literacy. Objectives: 1) Determine the self-efficacy of minorities and low-income populations with diabetes/CHD in FQHCs, and 2) Determine the impact of race on self-efficacy in these populations. Method: This study is part of the larger Office-GAP Project in two participating Ingham County Health Centers. The study is a quasi-experimental design with an intervention and control arms. 256 patients at the intervention and 243 patients at the control sites were enrolled into the study. The Stanford Self-Efficacy Questionnaire was used to obtain the data. The self-efficacy scores will be determined for each patient and the impact of race on the scores will be evaluated. Results/Conclusion: The available data will be analyzed and presented at the MID-SURE presentation. We hypothesized that minority and low-income patients that feel competent in managing their health condition will score better in the Self-Efficacy for Managing Chronic Disease Scale and Race will impact Self-Efficacy scores. Support: Evonte Terrell is a REPID* scholar supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director (*Research Education Program to Increase Diversity).

EFFECT OF SUCCESSIVE ANTIBIOTIC-TREATMENTS ON PREVALENCE OF ANTIBIOTIC RESISTANCE GENES IN THE INFANT GUT MICROBIOME
Jasmine Welch (Spelman College)
Category & Time: Integrative Biology, Section 4, 2:30 PM - 3:45 PM
Poster: 328
Mentor(s): Sarah Comstock (Food Science & Human Nutrition)

Background: Antibiotic use may cause lasting changes to the human gut microbiome. Members of the gut microbiome may assist in metabolism of food meaning disruptions of the microbiome by antibiotics could lead to obesity. Objective: Consider the effects of multiple, sequential antibiotic treatments in early-life on the prevalence of antibiotic resistance genes in the gut microbiome. Methods: To accomplish this, the prevalence of the following antibiotic-resistance genes is assessed: ermA, ereB, IMP-1 group,OXA-48 group, and oprm. Fecal samples collected from a single infant prior to any exposure to antibiotic treatment as well as time points post-treatment with antibiotics from the following classes: polymyxin B, penicillins, cephalosporins and macrolides. Bacterial DNA was extracted using a MoBio Powersoil DNA isolation kit following human microbiome protocol. Quantitative PCR was performed using microbial DNA qPCR assay kits from Qiagen. Results: There was prevalence of the antibiotic resistance gene ermA after macrolide exposure. Conclusions: The gut microbiome of the infant contained no antibiotic resistance genes prior to treatment with antibiotics. However, successive treatments with a variety of classes of antibiotics created antibiotic resistance genes in the infant gut microbiome. Implications: The results from this research will inform future studies on the relationship between early antibiotic use and childhood obesity.

MECHANICAL ENGINEERING

HIGH VELOCITY IMPACT TESTING OF COMPOSITES
Matthew Auvenshine (Michigan State University)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 330
Mentor(s): Xinran Xiao (Mechanical Engineering)

Composite materials offer a variety of benefits over traditional metals due to decreased weight and increased strength. Currently, no standards exist to test or compare the various properties of composites subject to high velocity impact. In this work, a method of determining the ballistic limit of S2-glass/SC15 epoxy composite was explored using an instrumented gas gun test. A gas gun was used to fire a 60g blunt cylindrical projectile at a panel of composite at various velocities. Four load cells were located behind the panel to measure the force of the impact, as well as two high-speed cameras; one located behind the panel to measure out-of-plane displacement and residual velocity of the projectile, and the other parallel to the panel to measure impact velocity of the projectile. Composite panels of 6-ply and 10-ply were tested, having ballistic limits of 329m/s and 381m/s, respectively. Evaluation of the load cell data revealed that failure modes evolved with velocity; as velocity increased, force decreased and damage changed from bending to shearing, as well as becoming more localized. Energy absorbed by the panels was determined as the difference between the initial and residual kinetic energies of the projectile. The composite was able to continue to absorb energy past the ballistic limit, up to a theoretical critical velocity. A way to compare the ballistic protection capabilities of various materials was proposed, derived as the kinetic energy at the ballistic limit normalized by the contact area of the projectile with the target.

FRICTION COEFFICIENT EVALUATION ON ALUMINUM ALLOY SHEET METAL USING DIGITAL IMAGE CORRELATION
Lisa Branchick (Oakland University), Emily Duan (University of Maryland Baltimore County)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 331
Mentor(s): Junrui Li (Mechanical Engineering), Guobiao Yang (Mechanical Engineering), Lianxiang Yang (Mechanical Engineering)

The coefficient of friction between surfaces is an important criterion for predicting metal behavior during sheet metal stamping processes. This research introduces an innovative technique to find the coefficient of friction on a lubricated aluminum sheet metal surface by simulating the industrial manufacturing stamping process while using 3-D digital image correlation (DIC) to track the deformation. During testing, a 5000 series aluminum specimen is placed inside a Stretch-Bend-Draw Simulator (SBDS), which operates with a MTS tensile machine to create a stretch and bend effect. The friction coefficient at the contact point between an alloy sheet metal and a punch tool can be calculated using an empirical equation previously developed. In order to solve for the unknown friction coefficient, the load force and the draw-back force are both needed. The tensile machine software only provides the load force applied on the specimen by the load cell. However, the draw-back force requires an indirect method of measurement. In this presentation, a method is proposed that uses DIC to measure tensile strain on a specimen's surface to acquire the draw-back force. This requires first collecting preliminary data to determine a tensile strain and draw-back force relationship. Once this force-strain relation is established, the tests to determine the friction coefficient can be performed and the friction coefficient is determined from the results of the final test data. The concept, set-up, procedure, and results of this research will be presented in detail.

NUMERICAL SIMULATION OF UPWARD FACING OIL-JET COOLING ON A FLAT PLATE
Aaron Demers (University of Wisconsin Whitewater), Morgan Jones (Trinity University)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 332
Mentor(s): Laila Guessous (Mechanical Engineering), Bolong Ma (Mechanical Engineering), Brian Sangeorzan (Mechanical Engineering)

For years, oil jets have been used on heavy duty and high performance engines. Particularly, they are being used to cool the undersides of pistons for passenger vehicles as the trend of increasing engine power density is consequently increasing the thermal loads on pistons. The effectiveness of this cooling method depends on many parameters, including the oil jet flow rate, the oil's fluid properties and the distance between the nozzle and the surface. In particular, knowing the jet impingement area is important for heat transfer calculations, yet very few studies have focused on upward liquid or oil-jet flows. This ongoing study aims to improve the understanding of the fundamental flow characteristics of upward oil jets. Using a finite volume-based computational fluid dynamics (CFD) solver, transient two-phase flow 3-D simulations of an upward facing oil jet impinging on a flat surface were performed for several oil flow rate and oil temperature values. The multiphase volume of fluid (VOF) and k-omega turbulence models were coupled to a 3-D structured mesh and used in this investigation. This presentation reports the results for the jet impingement area under different flow conditions as well as the results of our analysis of the downward-falling stream columns. The computational results of the oil jet simulations are compared to experimental measurements.

IN VIVO STIFFNESSES OF THE BUTTOCKS AND THIGH REGIONS IN HUMANS
Qiren Gao (Mechanical Engineering)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 333
Mentor(s): Tamara Reid Bush (Mechanical Engineering), Josh Drost (Mechanical Engineering), Wu Pan (Mechanical Engineering)

The soft tissue in the human body includes skin, muscle, tendons and adipose tissue. Soft tissue deformation properties are important for designing of devices that interface with the body, or in the development of human body models. The study of soft tissue deformation of the thigh and buttocks are especially important for seat designs and prosthetics as both interface with the body for long durations. An *in vivo* indentation method was developed and used to study the tissue characteristics. Custom-made indentor applied a load on the soft tissue and was used to measure the amount of force. Tissue deformation was tracked by 3D motion capture cameras and reflective markers on the indentor and on the human subject's hip joint and knee joint. The test region was on the human subject's buttock and thigh. Data were analyzed with a Matlab code. Results for this study provided data of deformation characteristics of the buttocks and thighs and comparisons between gender and individuals with different BMI values.

STABILITY ANALYSIS OF FLUTTER IN ARTICULATED FLUID CONVEYING PIPES
Dhruv Ghiya (BITS Pilani Hyderabad Campus India)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 334
Mentor(s): Ranjan Mukherjee (Mechanical Engineering)

Research has been done in studying and analyzing the flutter in articulated fluid conveying rigid pipes by T. B. Benjamin in his paper 'Dynamics of a system of articulated pipes conveying fluid, 1961'. In the system described by him, there is a constant flow of incompressible fluid through the pipes where the inlet end of the chain of pipes is fixed while the other end is free to move and the joints are assumed to have stiffness. In this paper, the motion is analyzed after introducing damping in the above mentioned system. With the appropriate arrangements, this system was practically built and analyzed using a motor attached to a pipe in a fish tank. A clear limit cycle is observed in the simulations for the motion of this system. Furthermore, a fish-tail like movement was observed in the fish tank arrangement. This result indicates that the motion can be used for the locomotion of a robotic fish.

FORCE AND DEFLECTION TESTING ON THE BUTTOCK AND THIGH TO STUDY MECHANICAL PROPERTIES OF SOFT TISSUES.
Maryrose Jakeway (Michigan State University)
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:15 PM
Poster: 335
Mentor(s): Josh Drost (Mechanical Engineering), Wu Pan (Mechanical Engineering), Tamara Reid Bush (Mechanical Engineering)

Studies have conducted soft tissue indentation testing on human bodies using MRIs and finite element analysis to discover that there are high strains located near bony prominences. Areas of the body experiencing high strain due to continuous load bearing are prone to developing pressure ulcers. These deep, penetrating wounds are common among the elderly and those with limited mobility. By furthering the research to better understand material properties of skin in contact with seating surfaces, we can develop cushions that reduce the high strains causing pressure ulcers. Currently, there are no studies specifically reporting material properties of the buttock and thigh. The goal of this research was to rectify that by determining tissue stiffness along six regions between the upper buttock and lower thigh. Force data was gathered using a load cell attached to an indentor which applied a force to each region until a bony prominence was reached. The use of motion capture and reflective markers were used to obtain the magnitude of tissue deflection. A number of male and female subjects with varying BMIs were tested and their data compared. Knowing soft tissue material properties of seated individuals can help improve cushion design in wheelchairs and prosthetics and ultimately reduce the occurrence of ulcers.

CONTRIBUTION OF COLLAGEN AND CARDIAC MUSCLE CELLS TO RESIDUAL STRESS DISTRIBUTIONS WITHIN THE LEFT VENTRICLE WALL
Marissa Grobbel (Michigan State University)
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 336
Mentor(s): Lik Chuan Lee (Mechanical Engineering), Sara Roccabianca (Mechanical Engineering), Sheikh Shavik (Mechanical Engineering)

Total stress distributions across the wall of the heart can be determined from the combined effect of outside forces, such as pressure from blood, and residual stresses within the tissue. If these residual stresses are not taken into consideration, a dramatically different prediction of the in vivo stress-state of the heart will result. It is hypothesized that the cause of the residual stresses is the interaction of fibers and muscle cells that constitute cardiac tissue. This study aims to quantify the residual stresses in rat left ventricles through opening angle experiments as well as identify the contribution of cardiac muscle cells and collagen to those stresses. Two groups of adult male rats, together with a consistent control group, were tested using different protocols to isolate collagen and cardiac muscle cells. The opening angle tests consisted of cutting two lateral slices of the heart, creating rings that expose the left and right ventricles. A radial cut was then made through the left ventricle, directly across from the right. This cut allowed the rings to open, achieving a stress-free state over 90 minutes. Pictures were taken during this period and the opening angles were calculated using Imagej. To isolate the cardiac muscle cells, a group was soaked in collagenase, a collagen-disrupting enzyme. In the second group, the collagen structure was isolated through decellularization. Differences in the opening angles of these groups will show the contribution of both cardiac muscle cells and collagen to the residual stress fields in the heart.

COMPUTATIONAL SIMULATIONS OF LATERAL ANKLE SPRAINS IN 5 TENNIS PLAYERS
Paul Heeder (Michigan State University)
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 337
Mentor(s): Roger Haut (Radiology Osteopathic Medicine), Feng Wei (Radiology Osteopathic Medicine)

Ankle sprains are a common injury in sports, and lateral ankle sprains are the leading type of injury sustained by athletes. Foot inversion is suspected in a lateral ankle sprain, but the mechanism of injury remains unclear. Fong et al. (2012) documents kinematics from 5 ankle sprain cases in tennis players during competition. While these cases were all diagnosed as a lateral ankle sprain, the involved motions have a large variation. In the current study, motion data (inversion, plantar flexion, and internal rotation) from the 5 cases was implemented into an existing computational ankle model in SolidWorks, and strain was calculated for the following 8 ligaments– ATiFL, PTiFL, CaFL, ATaFL, PTaFL, LTaCL, ITaCL and PTaCL. For the first 2 cases, the ATaFL had the highest strain, followed by the CaFL. In cases 3 and 4, the PTiFL, PTaFL, and ATaFL had the most, second most, and third most strain respectively. The PTaFL and ATiFL had the largest strain for case 5. A comparison of the time when maximum strain took place showed that internal rotation may have played an important role in these lateral ankle sprains. While it is possible for athletes to have varying degrees of joint motions during a ligament injury, much of this disparity can be due to different constraints on the ankle in different footwear. Future studies can be conducted to simulate shoe constraints as well as investigate their potential effects on kinematics of the foot with respect to the footwear and, consequently, lateral ankle sprains.

CONFORMAL DEPOSITION OF NANOCRYSTALS ONTO AN ARBITRARY SURFACE
Alexander Ho (Michigan State University)
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 338
Mentor(s): Rebecca Anthony (Mechanical Engineering), Alborz Izadi (Mechanical Engineering)

Nanocrystals can be used for a variety of applications due to their tunable optical and electrical properties. For many of these applications structures of varying geometry are required. Here a method for conformal deposition of luminescent nanocrystals onto surfaces of arbitrary geometry is investigated. In a single reactor, silicon nanocrystals were synthesized in a nonthermal plasma and deposited directly onto a substrate which was supported on a stand inside the plasma. Validation of a conformal coating of the nanocrystals on the substrate was accomplished through the use of scanning electron microscopy. To achieve the desired optical and electrical properties the nanocrystals need to be crystalline: control of the crystallinity was accomplished by adjusting gas flow rates and the power to the plasma. To verify that the nanocrystals were crystalline ultraviolet light was used to irradiate the sample and the response of the sample was measured with a spectrometer, if the sample exhibited a significant signal this indicated that the nanocrystals are crystalline. With continued variation of power, gas flow rates, and substrates, expectations are to achieve conformal deposition of crystalline nanocrystals. Our ongoing work includes studying the degree of conformality, based on the intricacy of the surfaces and their thermal and electrical properties.

THE PHYSICAL AND LUMINESCENCE PROPERTIES OF GALLIUM NITRIDE AND INDIUM NITRIDE NANOPARTICLES
Duncan Kroll (Michigan State University)
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 339
Mentor(s): Rebecca Anthony (Mechanical Engineering), Rajib Mandal (Mechanical Engineering)

Gallium Nitride (GaN), a direct-bandgap semiconductor, has been studied extensively in applications such as LEDs, solar cells, and transistors. GaN is particularly useful for its high efficiency and ability to perform under high temperatures and voltages. Nanoparticles of GaN can be cheap to make, have optoelectronic properties, and enable versatile deposition and flexible devices. We have recently built a low-pressure plasma reactor to make GaN nanoparticles. We hypothesize that by changing synthesis parameters and surface-functionalizing the nanoparticles, we can improve the nanoparticle physical and optoelectronic properties such as crystallinity and PL intensity and wavelength. During synthesis, gas phase precursors are flown through the plasma reactor at controlled rates, generating GaN nanoparticles. A slit-shaped orifice is used to create a pressure difference so the nanoparticles inertially impinge on the substrate to make thin films. The nanoparticle properties and film properties can be altered by adjusting the orifice width, changing the amount of time the substrate is under the orifice, changing what substrate is used, varying the gas flow rates, or adding other materials after deposition. We examined the physical and optical properties of the nanoparticles and films using Transmission Electron Microscopy (TEM), Fourier-Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), Electron Paramagnetic Resonance (EPR), and Photoluminescence (PL) spectroscopy. So far, we observe that GaN nanoparticles exhibit high crystallinity, but seem to have defects, based on their PL. We are working on diagnosing these defects, and also on novel plasma-based synthesis of Indium Nitride nanoparticles, which have similarly promising applications.

UNDERSTANDING THE BIOMECHANICS OF OPENING MEDICAL PACKAGES IN THE CONTEXT OF REDUCED CONTAMINATION
Megan Luzenski (Michigan State University)
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:15 PM
Poster: 340
Mentor(s): Tamara Reid Bush (Mechanical Engineering), Amber Cussen (Osteopathic Medicine)

The objective of this work was to explore the biomechanics employed by trained healthcare personnel when opening two different sizes of sterile packaging and presenting the contents onto a simulated sterile field. Reflective markers were placed on the upper body of participants at points of interest including the head, sternum, elbows, wrists, and hands. Participants were then asked to open six sterile packages, three of each size, and dispense the contents onto a simulated sterile field. Participants were observed and data regarding the number of pulls and hand repositions were recorded. Reposition type and the method of dispensing was also recorded. The participants' movements when opening the packages was tracked using a motion capture system. The data were then analyzed to determine pull distances and velocities as well as the time spent handling the package. Additionally, the amount of time spent over the sterile field was computed. The total movement of the participants was also calculated using the markers on the sternum and head. Results indicated that a higher average amount of handling was required when opening the larger packages. This handling presents a potential pathway for the spread of contaminants to the sterile contents held within the package. Future work should explore the connections between different handling events and contamination. Preventing the contamination of sterile medical instruments can reduce the spread of healthcare- associated infections.

DETERMINING THERMAL CHARACTERISTICS OF NEW COMPOSITE MATERIALS
Leanna Ngo (John Brown University) and Michael Goldhammer (University of Alabama)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 343
Mentor(s): Chris Kobus (Mechanical Engineering), David Schall (Mechanical Engineering)

Many new composite materials (such as ceramic foam and concrete-aerogel composite) have been engineered to surpass conventional materials specifically in their thermal insulative properties. These materials would allow structures to be built with several times the thermal resistance while maintaining structural integrity, which in turn, reduces the energy consumption and improves fire safety. Although the mechanical properties of some of these materials are somewhat known, their thermal properties have not been definitively determined. The current research project, in part, is to determine the thermal characteristics of these new materials by designing and building an appropriate experimentation apparatus. The test apparatus simulates one-dimensional conduction heat transfer through a test specimen, which allows for accurately measuring the R-value of the material, and in turn the thermal conductivity. With the results of this research, these new insulative materials have the potential to revolutionize the construction of buildings, refrigerated trucks, and recreational vehicles. Preliminary conductivity data are presented that yields similar values to those published for known materials.

LOW STRAIN RATE TESTING ON FIBER-REINFORCED MATRIX COMPOSITE MATERIALS
Hoa Nguyen (Michigan State University)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 344
Mentor(s): Dahsin Liu (Mechanical Engineering)

Fiber-reinforced matrix composite materials are excellent candidate materials for high performance structure and vehicles due to their high stiffness and strength with relatively low density. However, the mechanical characterization of composite materials at dynamic condition (high velocity and strain rate), is not as straight forward as that for static condition. Slip Hopkinson's pressure bars (SHPBs) have been commonly used for dynamic characterizations. Unfortunately, they are only useful for strain rates at least 1,000 (i.e. elongated specimen length is 1,000 times its original length), which exceeds the condition to which ground vehicles are subjected. In order to characterize composite materials at low strain rates, such as up to 100, a drop-weight impact tester (DWIT) based low strain rate testing technique has been established proved to be very useful for automotive applications. This proposed study is aimed at exploring the usefulness of the DWIT based technique in characterizing the lower end of the strain rate, such as 10 and below. The investigation of strain rates below 10 poses some potential challenge since it might be too low to use DWIT while it is too high to use a hydraulic testing machine.

QUANTIFICATION OF BIOLOGICAL CONSTITUENTS IN SOFT TISSUES
Laura Nye (Michigan State University)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 345
Mentor(s): Sara Roccabianca (Mechanical Engineering)

Soft biological tissue biochemical behaviors are largely affected by their mechanical properties. For example, loss of elasticity in the skin can create wrinkles and increased stiffness of arteries can aggravate hypertension. In most industry materials such as steel, small differences in microstructure among specimens are negligible. Unlike these materials, every biological specimen is different due to genes, environment, and age of the organism it has been collected from. These properties affect the mechanical behavior and are directly correlated to the amount of various biological constituents within the tissue (i.e., collagen, elastin, and smooth muscle). By comparing data from mechanical testing and histological analysis, the role played by each constituent can be determined mathematically. The goal of this project was to determine the percentage amounts of each biological constituent within various biological tissues, specifically urinary bladders and cardiac tissue. In order to do this, a small sample of tissue was collected from the specimens to be tested. These were then stained by the Investigative Histopathology Lab at Michigan State University. Each stain reveals different constituents of the tissue wall. Under a microscope, a high resolution image of the stained tissue was obtained. This image was then processed by a custom MATLAB code that identifies colors and counts pixels. This yielded the amounts of each constituent as area fractions that can be compared with mechanical properties of each sample.

CHARACTERIZATION OF THE MECHANICAL BEHAVIOR OF PULMONARY ARTERY
Akshay Rao (National Institute of Technology Karnataka)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 346
Mentor(s): Seungik Baek (Mechanical Engineering), Sara Roccabianca (Mechanical Engineering)

Pulmonary Arteries carry deoxygenated blood from the heart to the lungs. Pulmonary Hypertension (PH) is a condition that involves the narrowing of blood vessels connected to the lungs. Unlike systemic hypertension, PH is difficult to detect in routine clinical examination. Prolonged PH produces functional, geometrical, and mechanical property changes in the pulmonary arteries and the right ventricle. Therefore, understanding the properties of the walls of the pulmonary artery will help determine the cause of PH, diagnose it and even improve its treatment. Compared to previous small animal models, we develop experimental methods to characterize mechanical behaviors of the porcine pulmonary artery. Complementarily, histopathological studies aid to analyze its constituents (collagen, elastin, etc.) and arrive at a statistical correlation between the behavior and the proportions of the constituents. By experimental tests of inflation-deflation and uniaxial loading with image processing, we are able to obtain pressure-diameter, axial force and stress-strain information.
In particular, we investigate possible different behaviors related to physio-pathological conditions such as the contrast between low pressure (in vivo) and high pressure behavior (hypertension), which may be associated with the viscoelastic properties and the key role played by protein compositions.

THE SIMULATION AND DEPICTION OF THORACIC REGIONS IN COPD PATIENTS USING FORMULATED SOFTWARE
Justin Reed (University Of Maryland-Baltimore County)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 347
Mentor(s): Seugink Baek (Mechanical Engineering)

Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death in the United States and is predicted to be the third leading cause of death world-wide by 2030 (World Health Organization). Despite the prevalence of this disease, current diagnostic tools fail to be legitimate because they tend to under-diagnose patients or over-diagnose them. Our research objective was to develop tools to understand the geometrical features that are related to the pathology in COPD. We used three CT scan image sets which included one healthy patient's lungs, one patient's lungs effected by COPD in March, and a progressed COPD in the same patient in November. Next, we performed a segmentation analysis using MIMICS software, which can build the trees of multiple generations of bronchioles. We then constructed two anatomical models from the segmentations. Using the models, we conducted comparisons with the healthy data and the March patient and also analyzed the progression of COPD as well as the March and November COPD data. The geometric differences will allow us to further comprehend the geometrical features that are associated with the COPD symptoms and develop treatments. To draw further conclusions, we operated CRIMSON software to produce an airway flow simulation that included the pressure values, velocity, and tension for each comparison. After the findings are assessed, the geometric comparisons and the fluid simulations will provide us a better understanding of the disease progression and in turn aid to design a hypothesis-driven research.

EXPERIMENTAL INVESTIGATION OF ZRO2 TRIBOFILM FORMATION ON STEEL
Erik Romero (Texas Tech University), Colleen Fritz (The University of Alabama)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 348
Mentor(s): Laila Guessous (Mechanical Engineering), David Schall (Mechanical Engineering)

Zirconium oxide (ZrO2) based nanofluids have been shown to produce beneficial tribofilms under ambient temperature conditions in contrast to traditional additives such as ZDDP which require elevated temperatures for tribofilm formation. Such tribofilms aid in the reduction of wear on metal to metal contact such as those found in automotive components. In this study, the rate of tribofilm formation was investigated under a variety of different contact loads, environmental temperatures, rotational speeds, and concentrations of ZrO2 nanoparticles. Friction was measured during ball on disk tests conducted using a Universal Micro Tribometer (UMT-3). Tribofilm formation on the ball was measured using an optical surface profilometer. Because there were concerns with optical transparency of the film, the film formation was confirmed with a mechanical stylus. The composition of the film on the ball was investigated using a scanning electron microscope and energy dispersive spectroscopy and was confirmed to contain ZrO2. In preliminary testing tribofilm formation was observed on the ball at ambient temperatures with 0.1% ZrO2 in a synthetic PAO4 base oil, a sliding speed of 6000 mm/min, and a load of 0.9 kg.

CHARACTERIZING THE SHEARED EDGE OF ULTRA HIGH STRENGTH STEELS
Erika Rugh (Sweet Briar College) and Collin Malek (Oakland University)
Category & Time: Mechanical Engineering, Section 3, 2:30 PM - 3:45 PM
Poster: 349
Mentor(s): Sergey Golovashchenko (Mechanical Engineering), Saeid Nasheralahkami (Mechanical Engineering), Tim Zhou (Mechanical Engineering)

The incorporation of Ultra High Strength Steels into automobile design allows for improved fuel economy by reduction of weight through decreased use of materials. Trimming of sheet metal parts is an essential process required for stamping of all sheet metal components. During trimming, sheet metal undergoes deformation and fracture. This procedure often limits the amount of plastic deformation that the material can take in the area of shearing in post-trimming operations; such as flanging. Further material deformation is limited by splitting of the sheared edge during material stretching processes. The objective of this study is to characterize the sheared edge of sheet metal employed in the automotive industry by analyzing the burr height, burnish depth, and stretchability of the material and to develop a relationship between the mechanism of fracture and the cutting clearance (distance between cutting tools). Special attention is being paid to the evolution of the trim die condition by examining specimens of dual phase steel (DP980) at a cutting clearance of a specified percent of the sheet thickness. Samples were trimmed using the new die (0 cuts) and then collected after 50k, 100k, 150k, 200k, and 230k cuts of the trimming cycles.

CORRELATIONS BETWEEN THE PROGRESSION OF AAA AND COPD: FINITE ELEMENT DEFORMABLE REGISTRATION METHODS
Jason Sammut (Michigan State University)
Category & Time: Mechanical Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 352
Mentor(s): Seungik Baek (Mechanical Engineering)

Chronic Obstructive Pulmonary Disease (COPD) and Abdominal Aortic Aneurysms (AAA) are progressive diseases which originate in entirely separate regions of the thorax, with apparent contrast in their pathologies. However, recent studies suggest a relationship between the progression of AAA and COPD. To investigate the potential existence of correlation, digital image registration was applied to track patients' health information over extended periods of time. This research sought to develop an objective measurement of progression in each region through analysis of medical scans, which are then evaluated for correlation. To develop our analysis, we started with three sets of medical scans from an AAA patient. Mimics, a medical image processing software, was used to create a segmentation of the aortic wall and lung interior. Surface and volume meshes of the segmentation were then generated using 3-matic and Gmsh pre-process modeling programs. Grayscale values for each data point within the segmentation were interpolated on the mesh to determine material density. Alignment of the scans was completed with an iterative rigid registration code. The processed data and meshes were then exported to FEniCS, software capable of computational deformable registration. An original code will be constructed using existing platforms and innovative hyperelastic warping techniques to analyze the physical changes in patient geometry. Contrary to linear registration methods, hyperelastic warping is capable of registration with the large deformation in these models. The results will indicate disease progression in each region of concern, and analysis will be performed to compare AAA progression in relation to COPD progression.

FINITE ELEMENT SIMULATION OF THE INTERACTION BETWEEN THE CORONARY VESSELS AND MYOCARDIUM.
Vitor Santos Mamede (Federal University of Uberlandia)
Category & Time: Mechanical Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 353
Mentor(s): Lik-Chuan Lee (Mechanical Engineering)

The myocardium is a complex structure with different components, which include myocardial tissues and coronary vessels. The interaction between coronary vessels and the myocardium is one of the important aspects that are needed to understand the effects of the cardiac mechanics and perfusion. This interaction is poorly understood because experimental data can only allow us to infer but not capture the bidirectional effects of myocardial tissue and vessels directly. The finite element method is a powerful way to simulate different kinds of mechanical systems and will be used to develop some insight in this subject. A realistic geometry of the vessel that are embedded in the myocardium will be generate in the SolidWorks software and will be imported to the Hypermesh software to generate a reliable finite element mesh. The mesh will be used in simulations that will give us more understand of the effects on coronary vessels when the myocardium contracts. The software choose to make the finite element simulation was the FEniCS because it is freely available and is a powerful tool in complex systems simulations.

THE EFFECTS OF GLASS NANOPARTICLES ON STRUCTURAL ADHESIVES
Benjamin Swanson (Michigan State University)
Category & Time: Mechanical Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 354
Mentor(s): Mahmoodul Haq (Civil & Environmental Engineering)

Adhesives are currently the best way to join adhesives, since they don't introduce any flaws in the adhesive like rivets or bolted joints would. Therefore, improving their strength is something of interest for anyone working with composites. Joints with varying concentrations of 0%, 1%, 3%, and 5% glass bubbles were prepared. Mode I, lap joint fracture, and fatigue testing were performed in order to evaluate the strengths of the joints with each concentration of added nanoparticles. Video footage, data from the testing machine, and microscopy were all used to determine the behavior of the joints.

COMPARISON OF FORCE, STRETCH, TENSION AND ELASTIC STORED ENERGY OF DIFFERENT FASCIAL CLOSURE TECHNIQUES – A BIOMECHANICAL STUDY IN THE DOG
Yuheng Wang (Michigan State University)
Category & Time: Mechanical Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 355
Mentor(s): Sara Roccabianca (Mechanical Engineering)

Abdominal wall incision and closure is the most common surgical procedure in small animal practice. The aim of this study was to mechanically test the effect of different fascial closure techniques on the abdominal incisions in the dog. The study focused on correlating the mechanical property at rupture with different suture pattern, time required to perform the closure and surgeon who performed the closure. To analyze the role played by the interaction between suture and soft biological tissue we tested 17 dogs in total. From each animal we collected a total of four samples: three suture samples (i.e., 3 different suture patterns) and one control sample (i.e., intact sample of fascia). In addition, to measure the mechanical properties of the suture pattern alone, we performed the same closing techniques on leather samples (i.e., 6 for each suture pattern). We then tested them following the same protocol we used for the biological tissue. Each test has been performed on a uniaxial stretcher following this protocol: first all the geometrical characteristics were recorder before mounting the sample, then the samples were preconditioned with 10 loading-unloading cycles (20% of strain), finally the samples were deformed until rupture occurred. The experimental data have then been post-processed and statistically analyzed using Matlab. The mechanical parameters that we used are: maximum force, maximum stretch, maximum tension at rupture and stored elastic energy. In order to mitigate the animal-specificity we analyzed the results normalized by the maximum value of the control sample for each dog.

VISUALIZATION OF NEAR-WALL EDDY EVOLUTION IN TURBULENT CHANNEL FLOW
Jonathan West (Michigan State Univserity)
Category & Time: Mechanical Engineering, Section 4, 2:30 PM - 3:45 PM
Poster: 356
Mentor(s): Junlin Yuan (Mechanical Engineering)

Fluid flows can be separated into steady laminar flows and chaotic turbulent flows. Turbulent flow is an essential aspect to study as it augments stresses, mixing and transfer of mass and heat, which can be particularly harmful or helpful. The goal of this study was to compare the turbulence production processes, through visualization of the numerical data near smooth and rough walls, where highly resolved, 3-D data are hard to obtain experimentally. To this end, developed channel flows are simulated using an existing Fortran-based fluid solver. Factors such as Reynolds number, grid size, and run parameters were altered to obtain results at varying conditions. Simulations were carried out using HPCC servers; the 1-D flow statistics were compared with existing experimental results for validation using Matlab scripts. Then, the 3-D flow field was used to create instantaneous visualizations of velocity (U) and turbulent eddies (Q criterion) using Tecplot. Lastly, a Tecplot macro and Matlab script were created to automate the process to create videos from a collection of snapshots. Using the video generated, previous experimental observations were confirmed and statistical results explained.

PHYSICAL AND MATHEMATICAL SCIENCES

THE BETA DECAY OF 32CL
Eric Aboud (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:30 PM
Poster: 360
Mentor(s): Michael Bennett (National Superconducting Cyclotron Laboratory), Christopher Wrede (National Superconducting Cyclotron Laboratory)

^{32}Cl is a neutron-deficient isotope with a β-decay half-life of 298 ms and a spin and parity of 1+. It lies close to stability; therefore it can be produced in large quantities at rare isotope beam facilities making its decay relatively straightforward to study. Previous measurements of ^{32}Cl β-delayed γ rays have yielded β-decay schemes including allowed β decay transitions. In this study, we present the results of a more sensitive measurement of ^{32}Cl beta decay using the CloverShare array of high-purity germanium detectors at the National Superconducting Cyclotron Laboratory. By acquiring the highest-resolution and highest-statistics ^{32}Cl β-delayed γ ray data set to date, this experiment has allowed for the observation of several γ ray transitions that had only been previously observed in nuclear reaction experiments. A more complete decay scheme has been constructed, including the first observation of forbidden Gamow-Teller transitions in ^{32}Cl β decay.

STUDY OF NEW REDOX SHUTTLES UTILIZING TRANSITION METALS TO BE USED IN DYE-SENSITIZED SOLAR CELLS
Travis Belknap (Truman State University)
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 362
Mentor(s): Josh Baillargeon (Chemistry), Thomas Hamann (Chemistry)

Dye-sensitized solar cells (DSSCs) are photovoltaic devices that convert sunlight into electrical energy. This conversion process occurs when a dye molecule absorbs light and promotes an electron from the ground state to an excited electronic state. The excited dye becomes oxidized after injecting an electron into the conduction band of a semiconductor material to which it is attached. A liquid electrolyte, employing a redox shuttle, is used to regenerate the oxidized dye on the conductor's surface and works to outcompete recombination to the oxidized dye. The proper combination of sensitizer and redox shuttle is key to maximizing the current and voltage that can be extracted from a cell. To date, the most commonly used redox couple is an iodide/triiodide (I^-/I_3^-) system, which has been paired and well optimized for a certain set of dyes such as N3, N719 and Z907. However, the efficiencies of DSSCs utilizing this redox shuttle and sensitizer pairs have plateaued over the past decade, due to the limitations of the I^-/I_3^- electrolyte. Given the large energy mismatch required to regenerate the dye, as well as the fixed potential of the I^-, it is necessary to seek alternative redox shuttles that can effectively pair with new dyes. Transition metal complexes are of particular interest due to their tunable potential and straightforward electron-transfer kinetics, which can provide further insight regarding recombination and dye regeneration. In researching new redox couples and dye combinations, the goal is to better understand these kinetic processes in order to improve efficiencies.

THE OPEN NOVA CATALOG
Daniel Coulter (Michigan State University), Max Morehead (College Park High School)
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 363
Mentor(s): Laura Chomiuk (Physics & Astronomy)

Presently, publicly accessible data for classical novae is unorganized and difficult to find, and much of the known data is unpublished and at risk of being lost forever. Consequentially, obtaining information on novae is difficult and often times yield incomplete records. In response to this concern, we present the Open Nova Catalog, an online repository of all known data on classical novae. In addition to metadata, the Open Nova Catalog will contain photometric and spectroscopic data in various wavelength regimes. The interface is designed to be extremely user friendly, including the ability for the user to graph the data from the website. In addition to the data compiled by our group for the Open Nova Catalog, astronomers will be able to easily submit future data to the catalog. Our colleague at Harvard, Dr. James Guillochon, has recently completed a similar repository for supernovae, and will be collaborating on the Open Nova Catalog as well. Responses to the Open Supernova Catalog have been very positive, prompting us to create one for classical novae. With the completion of the Open Nova Catalog, we believe that finding data will be far easier than in the past. This will allow both professional and amateur astronomers to easily access and analyze classical novae, promoting progress in the field.

MAPPING THE DISSOLVED OXYGEN CONCENTRATION CYCLES IN THE SEDIMENT AND AQUEOUS ENVIRONMENTS USING FLUORESCENT DISSOLVED OXYGEN PROBES
Bradley Dillard (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 364
Mentor(s): Ruby Ghosh (Physics & Astronomy), Terrence Marsh (Microbiology & Molecular Genetics)

Developing and implementing a technique to accurately measure the dissolved oxygen concentration (DO) in real time is the focus of our research. Dissolved oxygen concentration in soil or aqueous environments is a key indicator of the capacity of the environment to support life and cycle nutrients. We aim to map DO concentrations in various environments to in order to seek trends and cycles in timespans ranges such as daily, seasonally, yearly and during weather events such as rainfall. We have developed a fluorescent dissolved oxygen probe capable of accurately sensing DO in both gas and liquid phase. My presentation will outline the DO cycles of various water and sediment environments and the relevance of being able to map changes across entire ecosystems.

FABRICATION AND ANALYSIS OF QUANTUM DOT SOLAR CELLS
Kyle Disselkoen (Calvin College)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 367
Mentor(s): Remi Beaulac (Chemistry), Chenjia Mi (Chemistry)

Quantum dots, which are nanoscale semiconductors, have unique properties due to their exciton confinement. Unlike bulk semiconductors, the dots have tunable band gaps that can be controlled by varying size distribution and composition. In solar cells, having the proper band gap is critical for the efficient injection of electrons into the titanium dioxide layer at the photoanode, which creates current flow. We successfully synthesized cadmium selenide quantum dots with oleylamine ligands in a colloidal solution. In order to make the dots water-soluble, we performed a ligand exchange with 3-mercaptopropionic acid. This ligand has a terminal carboxylate group that binds well to the mesoporous TiO₂ substrate. Ligand functionalization is a concern because quantum dots are known to have difficulty binding to the substrate in sufficient densities. To maximize quantum dot loading, we intend to perform further research on various deposition methods including drop casting and spin coating. Quantum dot sensitized solar cells use a redox couple that participates in hole transfer and is regenerated at the counterelectrode. Initially, we used a sulfide/polysulfide electrolyte that underwent a two-electron transfer. However, sulfides are known to poison the platinum catalyst on the counterelectrode over time. We intend to research other redox couples that also improve kinetic behavior in order to limit the unfavorable process of charge recombination.

ELECTROACTIVATED HETEROGENEOUS CATALYTIC ALKYLATION OF AMINES USING ALCOHOLS
Troy Dolmetsch (East Tennessee State University)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 368
Mentor(s): Souful Bhatia (Chemistry), James Jackson (Chemistry)

There is a need for direct N-alkylation of amines in the pharmaceutical and chemical industries. The synthesis of C-N bonds via alkylation typically uses alkyl halides, reagents that are notoriously volatile and toxic, as well as harmful to the environment. The electrochemical methodology presented here utilizes environmentally-friendly and inexpensive alcohols reacting under mild conditions. Reactions are carried out in a 1-compartment cell consisting of catalytic electrodes (both cathode and anode) and phosphate buffer pH 8.5 with currents ranging from 10 to 100 mA at 60 °C. The activated carbon cloth (ACC) attached to a stainless steel wire acts as a cathode and platinum wire as an anode. Samples taken at different time intervals are analyzed by ^{1}H NMR spectroscopy and GC Mass Spectrometry for qualitative and quantitative analysis. We observed selective methylation at sp^3 hybridized nitrogen sites to produce tertiary amines in unsubstituted aliphatic amines such as pyrrolidine, piperazine, piperidine, and morpholine. Future applications include mechanistic understanding of the reactions and expanding substrate scope.

RECONSTRUCTION BIASES IN THE ICECUBE NEUTRINO DETECTOR
Hannah Gallamore (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 369
Mentor(s): Tyce DeYoung (Physics & Astronomy)

The IceCube Neutrino Detector specializes in studying neutrinos, mysterious and nearly massless subatomic particles. The detector encompasses a cubic kilometer of ice and is comprised of sensors spread out evenly on vertical strings. The sensors detect photons, which are produced along with various other particles if a neutrino collides with a proton or a neutron within the ice of the detector. Reconstructions are an integral function in IceCube; they determine the particle paths, positions and energies using data collected by the sensors during a neutrino event. However, through a process called bremsstrahlung, muons produced in a neutrino interaction can release secondary cascades of electrons, photons and positrons. The photons from the secondary cascades are detected by the sensors and can possibly cause biases in the reconstruction's guess of the vertex of the original neutrino interaction. Discovering how big these biases are and if they have any correlation to the secondary cascades could help increase the accuracy of the IceCube reconstructions. This would allow for a better study of neutrinos and, possibly, explain more of the physics behind the incomplete Standard Model of particle physics.

SIMULATIONS FOR A NEW DETECTOR OF LOW-ENERGY BETA DELAYED PROTONS AT NSCL
Madison Harris (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 370
Mentor(s): Christopher Wrede (Physics & Astronomy)

Our current understanding of classical novae is limited by uncertainties in certain key nuclear reaction rates. Of particular interest is the reaction $^{30}P(p,\gamma)^{31}S$, which is a potential nucleosynthesis bottleneck. In order to reduce the uncertainty in that and other key reaction rates, a new detector based on micro pattern gas amplifier technology is being designed at the National Superconducting Cyclotron Laboratory. Through the detection of beta delayed proton emission from ^{31}Cl in the new detector, we will be able to measure the proton branching ratios of ^{31}S resonances providing a key component of the $^{30}P(p,\gamma)^{31}S$ resonance strengths. To aid in the design of the detector, Geant4 simulations of this device have been run to model its response to protons of different energies in a variety of gases and under different pressures. More specifically, we have investigated the energy deposition of protons as a function of position in the detector in order to study how various pad geometries affect the detection efficiency and the background due to beta particles. We have also been examining how various pad sizes and an outer ring to veto high energy protons affect both efficiency and background. Most recently, a high-statistics simulation reflecting a number of events comparable to a realistic experimental run was accumulated by incorporating the final geometry and dimensions planned for the detector. Currently, the beta decays of the isotopes that will be used for commissioning, ^{23}Al, ^{25}Si, and ^{32}Ar, are being simulated using the final geometry.

CONSTRAINING THE EQUATION OF STATE OF QUARK GLUON PLASMA
Johnathan Hill (Jackson State University)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 371
Mentor(s): Scott Pratt (Physics)

Quark gluon plasma (QGP) is a new state of matter, which is formed by colliding the nuclei of two heavy atoms such as lead, tin, and iron. It is believed that QGP existed in the beginning of our universe, femtoseconds following the Big Bang. Since it's recent lab creation in 2005, physicists have worked to formulate an equation where they can identify the properties of QGP. However, in order to further understand what QGP is and how it exists in the universe, extensive research must be done to the data being produced by the Large Hadron Collider (LHC) in order to formulate an equation of state that will allow us to identify the properties of QGP. Previous research has produced an equation of state of matter with 14 varying independent model parameters and constraints; however, this equation would not allow the analyses of the numerous particles produced in QGP due to the intertwined links between model parameters and numerous observables. In our research, we use basic programming techniques to predict and understand the physics of a complicated and short-lived state of matter (quark gluon plasma). The goal of our current research is to formulate a new equation of state of matter with fewer parameters and more constraints so that we can run analyses of an infinite number of particles without the previously stated difficulties. From our research, future researchers will have the opportunity to create QGP in a laboratory and use our new equation of state to analyze particles of QGP to understand and identify its properties.

NONINVASIVE METHOD FOR EARLY DETECTION OF EYE DISEASES
Alexius Lampkin (Albany State University)
Category & Time: Physical and Mathematical Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 372
Mentor(s): Marcos Dantus (Chemistry)

Biomedical imaging of the eye, specifically the retina could possibly lead to a noninvasive method for early detection of eye diseases. Common tests for eye disorders include but are not limited to angiography, electroretinography, ultrasonography and optical coherence tomography. Neither of these methods provide sub-cellular resolution required for early disease diagnosis. We are evaluating a femtosecond fiber laser to determine if retina samples provide sufficient contrast and resolution to detect retinal abnormalities. Second harmonic generation(SHG) and third harmonic generation(THG) signals were detected based on the different compositions of the retinal tissues. Neither SHG nor THG transfer energy into the retina avoiding any thermal damage or bleaching. Currently, our results show that the femtosecond laser can image the cross-section of the retina through SHG and THG through sub-cellular resolution. Through using the femtosecond fiber laser, to image the eye, an innovative diagnostic technique could be produced, since the retina does not have to be altered using a special fluorescein dye decreasing the amount of damage caused to the tissue.

AGING EFFECTS ON PVT SCINTILLATORS
Nathaniel Lashley-Colthirst (Howard University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 374
Mentor(s): Michael Thoennessen (Physics & Astonomy)

The MoNA collaboration is running an experiment in late July, 2016. In preparation for this experiment work is currently underway to get the experiment fully set up and operational. In effort to ensure the quality for the results of this and future experiments, my research project will examine the aging effects on the MoNA and LISA detectors. To examine the aging effects I am focusing on the attenuation lengths and mean gain matched voltages to see how they have changed over time. This will help ensure that experiments will produce respectable data and will give an idea for the remaining lifetime of the detectors. Similar studies have been performed at the Collider Detector at Fermilab (CDF) for many years. In which detectors, some every similar to those at MSU, have been periodically tested to determine the attenuation length at that point. The data provided from their articles give a rough idea for where to suspect the detectors may currently stand. However, the MoNA and LISA detectors have not been periodically checked, so I am using past data spanning the life of the detectors to retroactively find the variation of the detectors characteristics. This research will hopefully result in data that will help give the current status and future expectancy of these detectors moving on for future experimentations.

THE EFFECT OF METAL IONS ON SUPPORTED LIPID MEMBRANE FLUIDITY
Andrew McHale (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 375
Mentor(s): Stephen Baumler (Analytical Chemistry), Gary Blanchard (Analytical Chemistry)

Membrane fluidity can affect many different processes needed for the body to maintain homeostasis. Understanding the different factors that affect membrane fluidity can give medical professionals insights into a host of diseases, including certain types of cancer¹ and diabetes². In this work, we are investigating the effect different metal cations have on supported lipid model membrane fluidity. A monolayer of the lipid 1,2-dimyristoyl-sn-glycero-3-phosphonic acid (DMPA) was formed on a Langmuir-Blodgett trough. The surface pressure and mean molecular area of the DMPA monolayer were obtained at different subphase pH levels, and with selected metal cations in the subphase. Brewster Angle Microscopy (BAM) was used to observe the heterogeneity of the monolayer surface during layer compression. At lower pH values the monolayers exhibited more ordered, likely due to an increase in hydrogen bonding among the lipid head-groups. Electrostatic repulsion between negatively charged phosphate groups at higher pH creates increased disorder in the monolayer. Transitions between the DMPA liquid expanded and liquid condensed phases confirmed that the presence of metal ions mediates interactions among the DMPA molecules. Using a fluorescently labeled DMPA molecule, fluorescence recovery after photobleaching (FRAP) was used to characterize the fluidity of the monolayer. FRAP data suggest that the presence of metal ions between the lipid monolayer and the support surface exert a measurable influence on DMPA organization and fluidity.

ELECTROCHEMICAL POTENTIAL IN MICROFLUIDIC DEVICES
Matthew Murphy (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 376
Mentor(s): Yan Levitsky (Osteopathic Medicine)

The purpose of the research being done is to make a working electrochemical microfluidic cell that can be used to test the potential and current across the cell with various solutions. The electrodes will be comprised of gold and imprinted using photolithography, whereas the channels of the microfluidic device are to be made from a PCB cutter milling device. The device is used to simulate the biological electron transport chain in mitochondria, which is fundamental in the synthesis of ATP used for energy. Microfluidics are useful for measuring more rare or expensive samples in a minute volume compared to other methods

HARNESSING DROP COAT DEPOSITION RAMAN SPECTROSCOPY FOR NON-INVASIVE CANCER DIAGNOSIS
Sophia Potter (Michigan State University), James Jabara (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 377
Mentor(s): Rebecca Lahr (Lyman Briggs College, Civil & Environmental Engineering)

Colorectal cancer (CRC) is now cited as the third most common cancer worldwide. Diagnosis currently requires invasive sampling and typically results in late stage detection; thus rapid, non-invasive detection provided by drop coating deposition Raman spectroscopy (DCDRS) of human blood plasma is preferred. Raman spectroscopy has assisted in enhancing cancer detection for decades, but only one application of DCDRS for cancer detection has been developed since its discovery in 2003. DCDRS has previously detected differences between fifteen patients with stage III or IV CRC with a mean age of 54 and twenty-one healthy patients with a mean age of 38. Plasma of patients with different illnesses was not evaluated previously, so in this study we are comparing DCDRS images of blood plasma from both healthy patients and patients with CRC, rheumatoid arthritis, lung cancer, and prostate cancer. Raman spectral images will be analyzed by principal components analysis (PCA) and multivariate curve resolution–alternating least squares (MCR-ALS). This work will determine if DCDR can detect and differentiate between various types of cancer.

SHAPE COEXISTENCE IN ^{69}Co
Daniel Puentes (Florida International University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 378
Mentor(s): Sean Liddick (Chemistry)

Shape coexistence has been studied extensively to understand the structure of rare isotopes. Evidence for rapid change between normal configurations and deformed configurations has been identified in various nuclei around ^{68}Ni. As an example, two β-decaying states in $^{69}_{27}$Co have been identified. However, their relative energy separation is unknown and there are some suggestions that the deformed configuration is the ground state. Observance of a weak γ-ray would fix the energy difference between the two states of $^{69}_{27}$Co difficulty with this particular state is due to the state's long half-life of 750-ms as well as a strongly competing β decay. Identification of this energy difference would allow for a better understanding of the systematics of deformation in the Ni region as a function of neutron number.

DEVELOPING PALLADIUM FREE SYNTHESES VIA SONOGASHIRA COUPLING REACTIONS
Kenyetta Smith (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 379
Mentor(s): Robert Maleczka (Chemistry)

Double-decker silsesquioxane (DDSQ) cages can be used as components of inorganic/organic hybrid materials that have useful properties in high heat and stress environments such as engines. When capped with certain organic compounds there was unexpected heat degradation. It is not known why this occurs but it could be attributed to trace amounts of palladium. Palladium is used as a catalyst in the synthesis of the capping agent, so it is of great interest to find a synthesis without using palladium. This research focused on developing palladium free synthesis of bromo-4-(phenylethynyl)benzene, 4-(phenylethynyl)phthalic anhydride (PEPA), and methyl-4-phenylethynylphthalate. One pot syntheses were carried out to couple different starting materials with phenylacetylene via the Sonogashira coupling reaction. The conditions (solvent, base, catalyst, and temperature) of the reactions were varied to obtain the best possible yield. NMR and GC analyses were performed to confirm the identity of the desired products. Percent yield was determined by weight. A 97% yield of bromo-4-(phenylethynyl)benzene was observed when using 5 mole percent dichlorobis(triphenylphosphine)nickel(II) and 10 mole percent copper iodide as a catalyst along with potassium carbonate as a base and a mixture of dioxane and water as a solvent. The same conditions were used to attempt to synthesize PEPA and and methyl-4-phenylethynylphthalate but the reactions were not successful. It is clear that type of solvent and base has a strong effect on how well the catalyst performs and how successful the reaction will be. Due to this relationship it is important to assess the performance of different solvents and bases in future research

CHARACTERIZING HADRONIC COSMIC RAYS VIA JET SUBSTRUCTURE RECONSTRUCTION AT HAWC
Ben Tamagne (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 382
Mentor(s): James Linnemann (Physics & Astronomy)

Cosmic rays (CR) consist of charge-neutral photons, and charged hadrons, i.e. massive particles such as protons. Upon entering Earth's atmosphere, these particles collide with other particles and form a cascade of interactions known as a CR shower. Showers initiated by very high energy hadron interactions produce discrete jets of fragment particles that can be observed as characteristically distinct from photon initiated showers. This analysis employs jet clustering software, used in high energy physics (HEP), to search for jet substructure and uses

clustering algorithms to distinguish between electromagnetic and hadronic showers using ground-based observations. Patterns produced by a hadronic shower will typically have a larger, more diffuse footprint with multiple local maxima, as it is monitored by a detection array; this is in contrast to a smoother and more localized footprint produced by an electromagnetic shower. Using clustering software to distinguish between hadronic and electromagnetic showers is a new application in CR research of HEP jet analysis techniques developed at CERN and elsewhere. The successful characterization of showers aids in identifying distinct CR sources, as hadronic showers provide a significant background when identifying these sources.

PLANNING A NUCLEAR PHYSICS EXPERIMENT TO CONSTRAIN CALCIUM PRODUCTION IN NOVAE
Pranjal Tiwari (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 383
Mentor(s): Christopher Wrede (Physics and Astronomy)

Calcium is an element that can be produced in astrophysical explosions called novae. There are discrepancies between the abundance of Calcium observed astronomically in novae and what we expect to see through astrophysical models. The present work describes preparations for a nuclear physics experiment designed to measure the energies of the excited states of 39Ca. States in a certain energy range affect the production of Calcium in nova models. In the experiment, we will take a thin sheet of 40Ca and bombard it with a beam of deuterons. This bombardment will result in a tritium and 39Ca, which is what we are interested in. We will be using a Q3D magnetic spectrograph in Munich, which will allow us to accurately record the momenta of tritons and therefore the excitation energy of the resulting 39Ca. I ran simulations to determine the optimal spectrograph settings (observation angle, magnetic field) using the information we currently know, and investigated different target options. Using a target of pure calcium is problematic, since pure calcium reacts with air, so we decided to use a chemically stable compound CaF2. But doing so resulted in an extra contaminant, Fluorine, which I found could be dealt with by measuring the background using a LiF target. Ultimately, my simulations have led to settings and targets that will result in the observation of the 39Ca states of interest with minimal interference from contaminants.

NOVEL ADAMANTANE-BASED COORDINATION POLYMERS
Jamelah Travis (Hope College)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 384
Mentor(s): Robert LaDuca (Chemistry)

Coordination polymers are crystalline solids with metal atoms linked together by organic ligands. Cobalt- and nickel-based coordination polymers often show interesting magnetic properties. Zinc- and cadmium-based coordination polymers can act as sensors for explosive nitroaromatic compounds. Reaction of a metal nitrate, an adamantane-based dicarboxylic acid, and a dipyridyl ligand in high-pressure liquid water produced several new coordination polymers. [Co(adc)(4-bpmp)]_n (adc = adamantanedicarboxylate, 4-bpmp = bis(4-pyridylmethyl)piperazine) displays carboxylate bridged {Co₂(OCO)₂} cluster units bridged into a complicated 3D network. Use of the longer 1,3-adamantanediacetate (ada) ligand afforded {[Zn(ada)(dpa)]·3H₂O}_n (dpa = 4,4′-dipyridylamine), which shows a stacked layer structure, and has proven capability as a detector for nitroaromatic environmental contaminants.

REPURPOSING DOPAMERIC PHENOTHIAZINES FOR PROTEASOMAL ACTIVATION TOWARDS TREATMENT OF NEURODEGENERATIVE DISEASE
Kyle Truszkowski (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 385
Mentor(s): Corey Jones (Chemistry), Jetze Tepe (Chemistry)

The Phenothiazine core moiety has been the basis for numerous drugs with effects ranging from anti-histamines to antipsychotics. Through the use of high throughput screening, an FDA approved D2 antagonist was identified as an activator for the 20S constitutive proteasome. Docking studies identified the potential binding site as one of the intersubunit pockets on the proteasome's alpha ring. Using this as a guide, a number of compounds have been synthesized with the aim of activating the human proteasome the *in vitro* for degradation of alpha-synuclein, an intriscally disordered protein implicated in the Parkinson's disease pathology, and removal D2 receptor activity. Achieving selectivity could open new avenues of therapy options that treat the underlying condition of many neurodegenerative disorders, accumulation of disordered proteins, instead of current therapies which focus on symptom management.

ELECTROCHEMICAL CHARACTERIZATION OF NOVEL CARBON POWDER ELECTRODES
Drake Turcotte (Michigan State University)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 386
Mentor(s): Andre Castiaux (Chemistry), Greg Swain (Chemistry)

Carbon powder electrodes often require the use of a pasting liquid, such as mineral oil, or binding polymer to hold the powder particles in place and to ensure good electrical contact through the powder network. So-called carbon paste electrodes have been used for over 5 decades now. These electrodes work well for electroanalytical measurements but when one wants to study specific surface microstructure and chemistry effects, it would be advantageous to study the powders without a surface contaminating binder. The goal of this work is to evaluate the electrochemical properties of two carbon powders confined in a new binderless powder holder that can hold small amounts of carbon powder (<100 mg). This new holder is being used to characterize glassy carbon powder (5 μm diam.) overcoated with a thin layer boron-doped ultrananocrystalline diamond (B-UNCD) or graphite nanopetals. These powders are formed by microwave-assisted plasma CVD using a core shell approach. We will report on cyclic voltammetric studies of the background electrochemical properties of the different powders in aqueous electrolyte solutions and on the response toward several redox probe molecules: methyl viologen, Ru(NH₃)₆^{3+/2+}, Fe(CN)₆^{3-/4-} and IrCl₆^{2-/3-}

INTRA- AND INTER-MOLECULAR EXCITED STATE DYNAMICS OF CYANINE DYES
Morgan Webb (Lyon College)
Category & Time: Physical and Mathematical Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 387
Mentor(s): Muath Nairat (Chemistry)

Photo-initiated processes associated with charge transfer upon electronic excitation play a key role in the dynamics of many important processes, such as photosynthesis and vision. Being able to better understand the intra- and inter-molecular mechanisms that occur between organic molecules soon after excitation can lead to a better understanding of these processes. We will be synthesizing several cyanine dyes with different meso-substituted aniline derivatives. It follows that the prepared dyes should have different photophysical properties, including a change in their dipole moment upon electronic excitation. This property change is linked with the charge transfer that occurs upon photo excitation. We will report on the use of shaped femtosecond laser pulses to gain a better insight into the early time-scale dynamics of these dyes after excitation. The results are analyzed to extract information on the intramolecular charge transfer dynamics. We expect to clarify the relationship between the dye molecule structure and photophysical properties using steady-state spectroscopy.

SOCIAL, BEHAVIORAL, AND ECONOMIC SCIENCES

GEOGRAPHIC VARIATION IN EMPATHY: A STATE-LEVEL ANALYSIS
Rachel Bach (Beloit College)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 390
Mentor(s): William Chopik (Psychology)

Differences in personality are often studied at the individual level, but little is known about variations in personality across geographic regions and how this variation is associated with important region-level outcomes. This current study examined associations between empathy, prosocial behavior, and anti-social behavior in the 50 United States. Participants were 79,563 adults residing in the United States. Information on prosocial and anti-social behavior were retrieved from government databases. State-level empathy was associated with higher volunteer rates. State-level perspective taking and overall empathy were associated with higher well-being. Finally, overall empathy predicted state-level variation in personal crime rates. Future research can examine other factors that explain between-state variation in interpersonal behavior, including weather and income inequality.

ADVANCING DOMICOLOGY THROUGH DECONSTRUCTION
Darius Bates (Jackson State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 391
Mentor(s): Arya Anuranjita (Construction Management), Dr George Berghorn (Construction Management)

The U.S demolishes 245,000 residential and 44,000 commercial structures each year and adds 143 million metric tons of waste to landfills each year. The removal of all of the currently estimated abandoned residential properties alone in the U.S. could cost the U.S taxpayer approximately 78 billion dollars. The emerging field of Domicology addresses structural abandonment, and represents a paradigm shift in reducing the negative social, environmental, and economic impacts of the built environment. Deconstruction is an alternative strategy proposed to reduce the harmful and wasteful impacts construction demolition places on the economy and the environment. Deconstruction contributes to controlling the amount of waste placed into landfills through a process of recycling and re-purposing building materials.This framework will identify key material and Deconstruction process impacts to ultimately measure the social, economic benefits of Deconstruction. As a result, Deconstruction advances Domicology by potentially reducing social, economic, and environmental challenges of the built environment. Life Cycle Analysis is a well-known technique used to measure potential environmental and economic impacts during the life cycle of a product or process. The goal and scope of this research is to explore new Sustainable Life Cycle Assessments methodologies that will provide the framework necessary to build a Deconstruction Life Cycle Assessment model. Ultimately, this work will promote green building and aid in strategically planning the way buildings are constructed and Deconstructed.

TESTING RACE BIAS IN POLICE OFFICERS USING A SHOOTING SIMULATOR
Matthew Bolton (Prairie View A&M University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 392
Mentor(s): Joseph Cesario and David Johnson (Psychology)

Police officers must often make split-second decisions about whether to shoot a suspect. Researchers have been interested in whether those decisions are biased by information such as the race of a suspect. In preceding studies results show that civilian participants show racial bias in their decisions to shoot black and white targets. Unarmed black targets were shot more frequently than unarmed white targets in less realistic measures using button responses to still images on a computer screen. In an attempt to improve this task, we addressed these concerns by having police officers from a major Midwest municipal police force fire a modified handgun in response to life-sized videos of armed and unarmed targets. The findings of this current study display that officers shoot armed black targets quicker than armed white targets, but this effect was not significant. Results also find that police officers correctly identify and do not shoot unarmed black targets and unarmed white targets at similar rates, showing no race bias, in contrast to untrained individuals from previous studies. These findings conclude that officers can better focus on relevant information such as weapon identification rather than irrelevant information (race) in experimental shooting simulation task.

ASSISTANCE GAPS AND LEGAL LOOPHOLES: FAILURES OF COUNTER-HUMAN TRAFFICKING POLICY
Morgann Brafford (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 393
Mentor(s): Stephanie Nawyn (Sociology)

There is a growing scholarly and policy interest in human trafficking. This interest has focused predominantly on the trafficking of women and girls for the purposes of coerced sex work. Consequently, policies designed to assist trafficking victims focus on removing women from sex work, whether or not they entered that work under force, coercion, fraud, or willingly. For unauthorized international migrants, counter-trafficking laws rarely include sufficient screening to determine if migrants have been trafficked, nor polices that decriminalize unauthorized migrant employment, thus leaving migrants vulnerable to human trafficking and other forms of labor exploitation.
We explore these problematic tendencies in human trafficking interventions and victim assistance by using the country of Turkey as a case study. There are reasons to suspect that Turkey's current laws and policies will not sufficiently protect migrants from trafficking. Using data from fieldwork among NGOs in the Turkish cities of Istanbul, Ankara, and Antalya as well as analyses of laws and policy reports, we analyze the current rights and assistance regimes offered to trafficking victims and how those services could be improved. We argue that because domestic and international policies designed to curb human trafficking exist within a frame of criminal law enforcement and ignore labor rights, they may in fact be causing immigrants to be more vulnerable to traffickers and provide an insufficient framework for appropriately assisting victims.

DEFINING THE RELATIONSHIP BETWEEN INITIAL LANGUAGE SKILLS AND NARRATIVE SKILL DEVELOPMENT
Cecelia Campbell (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 394
Mentor(s): Lori Skibbe (Human Development & Family Studies)

A narrative is the telling of a fictional, or true, sequenced experience or event (Engel, 1995). Narrative assessment is a reliable approach to assessing language that can be used in a natural, realistic setting (Schraeder, Quinn, Stockman, & Miller, 1999). However, not much is known about how narrative skills develop over time. We will examine this directly. Also, there is not much out there about the relationship between children's initial language skills and their performance on narrative assessments. Our study examines whether children's initial language abilities predict improvement in their development of narrative skills. The Narrative Assessment Protocol (NAP) was created to support narrative assessments in becoming routine in language screening and assessment in preschools (Justice, Bowles, Pence, & Gosse, 2009). Three hundred forty-two children were tested; one hundred fifty-seven of them being female and one hundred eighty-five being male. Children used a wordless picture book to retell stories four times over two years. They also were given the Clinical Evaluation of Language Fundamentals at the first time point. We will graph children's narrative performance over time and also study how narrative growth relates to language development, using a correlation analysis. We hypothesize that children's narrative abilities will grow over time and that initial language abilities will predict children's development of narrative skills.

PUBLIC SUPPORT FOR FEMALE POLITICAL CANDIDATES
Sydney Carr (University of Connecticut)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 395
Mentor(s): Corwin Smidt (Political Science)

Historically, women have been severely underrepresented in elective positions in the U.S., displaying a critical gender gap in political office. This study will take on a longitudinal analysis from the 1970s to present to examine the demographic factors that correspond to public support for female candidates for political office. The primary method used in this study will be General Social Survey data in order to measure participants' answers to a certain set of questions regarding support for female political candidates. To do this, certain demographic variables will be measured including race, gender, age, level of education, and level of income. These demographic predictors will be examined across four decades ranging from the 1970s- 2000s. By conducting this study longitudinally, it can be determined how and why public support for female candidates has changed over the years. In measuring these certain demographics variables, perceptions and stereotypes toward female candidates for political office can be further understood. By understanding these perceptions, this can present important research on why the gender gap between men and women in electoral politics exists. Ultimately, the goal of this study is to determine levels of support for female candidates in the U.S. by conducting a regional analysis across the 50 states. The predicted outcome of this study is that by measuring public support for female candidates on a state by state basis, it can determined what influence perceptions toward female candidates has on there running for and/or winning political office.

RACE BIAS IN SHOOTING DECISIONS: TESTING POLICE OFFICERS IN AN IMMERSIVE EXPERIMENTAL SHOOTER TASK
Romulus Castelo (University of Maryland)
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:15 PM
Poster: 396
Mentor(s): Joseph Cesario (Psychology)

A multitude of psychological studies over the last decade have indicated that people, primarily undergraduate students and other untrained civilians, typically show racial bias in shooting decision tasks. In these tasks, participants are instructed to quickly press "shoot" or "don't shoot" buttons in response to static images appearing on a computer screen of a Black or White male equipped with either a gun or a harmless object such as a cellphone. Race bias is typically observed such that participants incorrectly shoot unarmed Black males more than unarmed White males, and correctly shoot armed Blacks more quickly than armed Whites. However, these tasks are difficult to generalize due to their severely low external validity and their use of untrained individuals rather than actual police officers. To address these issues, we recruited sworn police officers from a major Midwestern police force to complete a shooting task using a more immersive shooting simulator. In the simulator, officers viewed life-sized videos of Black and White targets quickly pulling out either guns or cellphones and had to respond by firing a modified

handgun, which recorded their decision and response time with millisecond accuracy. In contrast to previous findings with untrained civilians, police officers did not show racial bias in their shooting decisions; they were fast and accurate with their decisions. These findings suggest that police officers, unlike untrained civilians, can better focus on the weapon rather than irrelevant cues like the race of the suspect.

FACTORS AFFECTING LISTENERS' ABILITY TO UNDERSTAND SPEECH IN NOISE
Alyssa Cleland (Michigan State University), Klea Doko (Michigan State University), Ian MacDonald (Michigan State University), Stacey Rowland (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 399
Mentor(s): Lauren Amick (Psychology), Elisa Kim Fromboluti (Psychology), Devin McAuley (Psychology)

On a daily basis, we attend to meaningful sounds in the environment, such as speech and music, in the presence of a cacophony of other sounds. Older adults, with and without significant hearing loss, often have much greater difficulty understanding speech in the presence of competing sounds than do younger adults. Although peripheral hearing loss accounts for a large portion of the variance in listeners' ability to understand speech in the presence of competing sounds, other factors (e.g., cognitive or central auditory factors) appear to play an important role. To investigate the contribution of different factors to individual differences in speech understanding in noise, young adult participants completed a large test battery over five sessions; the battery included assessments of basic auditory capabilities, rhythmic ability, cognitive ability, and speech understanding in different background environments. One hypothesis guiding this work is that effective speech understanding in the presence of competing sounds depends on the ability to follow the temporal structure of an utterance and to accurately anticipate the timing of speech events through a process of attentional entrainment. Moreover, accurate extrapolation of temporal patterns through inaudible or partially audible portions of an utterance is proposed to facilitate the integration of intermittent "glimpses" of speech by incorporating them in a common temporal framework. Results will be presented from an initial sample of approximately 100 participants who have completed the test battery to date across two performance sites (Michigan State University and Indiana University).

CAN MARKETS REALLY DO THE JOB? A META-ANALYSIS OF MARKET-BASED REDEVELOPMENT EFFORTS
Alexandra Cull (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 400
Mentor(s): Richard Hula (Political Science)

This project is a meta-analysis of existing research on federal efforts to leverage private sector credit to spur economic and community development in low income areas. This birthed a profusion of geographically-based programs. An intensive review of existing literature is an essential first step in generating conclusions as to the impact of these programs, their level of efficiency, bureaucratic control, and their impact on local politics.
These programs to be examined in this research seek to leverage private investment through a variety of incentives. Examples include a pure-market approach through the Home Mortgage Disclosure Act (1995) and Community Reinvestment Act (1997); an investment-targeted approach involving Low Income Housing Tax Credits (1986) and the New Markets Tax Credit (2000), and a laisse-a-fair capitalistic approach featuring the Empowerment Zone and Enterprise Community Initiative (1993). All of these have offered some variant of off-the-budget tax breaks. A preliminary analysis of existing empirical research has indicated decentralized market-based programs fail to yield effective results for individuals while often profiting large financial firms. Therefore, a new generation of centralized federal redevelopment promoting people-based programs may produce more noteworthy results.

MINORITY WOMEN AND LATENT CANDIDACY: FACTORS INFLUENCING UNDERREPRESENTATION OF MINORITY WOMEN IN AMERICAN POLITICS
Kesicia Dickinson (Jackson State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 401
Mentor(s): Eric Juenke (Political Science), Jamil Scott (Political Science)

Minority and female representation have both increased over the last few decades; however, women of color remain tremendously underrepresented. In effort to prepare to pursue political office, many minority women attend candidate training programs such as the Women's Campaign School at Yale University. The experience garnered through these programs, combined with strong legal or business backgrounds, high educational attainment, and previous political experience, make these women prime political candidates (traditional candidacy pool); yet, the number of women of color actually running for political office remains staggeringly low. In this observational study, I will examine factors that influence this phenomenon. I will collect data from the Emerge candidate training program official sites for Maryland, New Jersey, and Virginia that includes information regarding educational attainment, party involvement, profession, etc. I will combine this information with preexisting data files including women of all races to add variation to the project before running analyses to investigate trends amongst ethnicities. I expect to find that even after completing candidate training programs, minority women are less likely to run for public office due to race-related and gender-related stereotypes— intersectionality. These findings will lay the foundation to promote the importance of female, minority representation to political parity. It will also help to improve the structure of assistance designed to reverse the phenomenon such as candidate training programs.

INTERNET USE AND ILLEGAL CIGARETTE PURCHASE RELATIONSHIPS
Nicholas Haughton (University of Florida)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 402
Mentor(s): Jay Kennedy (Criminal Justice)

Individuals who smoke often try to find cost effective way to purchase tobacco due to high tax rates, such as searching for regulated goods in unregulated space. U.S. consumers often go to illegal Internet sites to purchase tobacco products, not knowing these sites are unregulated entities that sell products that often do not collect appropriate taxes, and often sell counterfeit products. In addition, they lack age verification

procedures to ensure that minors cannot purchase these products. Ultimately, internet sites must implement age verification procedures, collect appropriate taxes, and can only sell cigarettes made within the U.S. However, most Internet sites do not meet these standards, and deviate away from these requirements. The aim of this research is to investigate potential relationships among smokers' online behaviors and their exposure to harm on the Internet. Using data from the most recent wave of the State of the State Survey (SOSS), and was analyzed through regression analyses. We test three related hypotheses: 1) younger smokers who use the Internet are more likely to exhibit risky behaviors while online; 2) levels of online personal guardianship(risky behaviors while online) are related to perceptions of the quality of goods found on the Internet; and 3) perceptions of the quality of goods found on the Internet is related to the decision to buy tobacco online. Study results will have implications for public policy in Michigan related to regulation of the Internet, and smoking reduction/cessation programs.

HOW DO SELF-REGULATORY BEHAVIORS RELATE TO CHILD PERFORMANCE ON A NARRATIVE TASK?
Abigail Hayek (Michigan State University), Carolyn Golden (Michigan State University), Halle Peterson (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 403
Mentor(s): Haruka Konishi (Human Development & Family Studies), Kyla McRoy (Human Development & Family Studies), Lori Skibbe (Human Development & Family Studies)

Working memory, inhibitory control, and task-switching are all components of self-regulation (Morrison, Ponitz, & McClelland, 2010). Research has shown that preschool levels of inhibition are unique predictors of kindergarten language comprehension (Blair & Razza, 2007). However, less is known about how specific self-regulatory behaviors relate to task performance. The present study aims to investigate the types of self-regulatory behaviors children display during a narrative task and whether those behaviors relate to their language knowledge. Children ranging in age from 4 to 6 were told a story from a wordless picture book and then asked to retell the story to an assessor. These stories were coded to capture children's language abilities, based on extant work in the field (Justice, Bowles, Pence, Gosse, 2010). Children's self-regulation skills were identified using various repeated on-task behaviors, or behaviors that facilitate performance on the narrative task (e.g. looking at the book). Then, the duration of this behavior was calculated using a coding software called ELAN. Finally, we assessed the relationship between duration of on-task behaviors and children's language abilities. The findings of the present study may help us understand how self-regulation impacts early academic success.

PEOPLE OVER PARTS: CULTURAL CONSENSUS MODELING IN THE FLINT WATER CRISIS
Jane Henderson (University of San Diego)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 404
Mentor(s): Steven Gray (Community Sustainability), Laura Schmitt-Olabisi (Community Sustainability)

The Flint Water Crisis (FWC) garnered national and international attention after Virginia Tech researchers determined lead levels in local water were 800 times greater than federal recommendations. When the emergency manager changed the water source from Detroit to the Flint River, exposure to lead and other toxins created a public health emergency affecting thousands of people. Emergency responders and government agencies worked to solve the crisis, but the solutions are disconnected from the continued emotional and physical needs of the traumatized residents. Responding to the FWC requires a consensus on the causes, consequences and solutions, however there is little knowledge whether the Flint community comprised of residents, emergency responders, government officials and community organizations are aligned in their understanding of the crisis. Beginning with community identified common themes from mental modeling workshops, we created a cultural consensus model (CCM) allowing us to gauge the level of agreement of beliefs in the Flint community. In surveying the community, we suspect there will be a gap in understanding of the evolution and impact of the FWC. The culmination of deindustrialization, economic disinvestment, racism, poor leadership and the aging of municipal infrastructure in Flint foreshadows the possibilities other cities may confront in the near future. Flint residents are most impacted and we hope this research will raise community members voices in the solution process. It is our goal that our findings will create effective collaboration leading to better support of residents.

TOWARD A TYPOLOGY OF ENTREPRENEURIAL ECOSYSTEMS
Grace Hough (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:15 PM
Poster: 405
Mentor(s): Elizabeth Mack (Geography)

Much of the work on entrepreneurial ecosystems (EE) has emphasized inventories of components in an effort to understand the supportive attributes of these environments and the types of ecosystems in which entrepreneurs operate. More recent work on ecosystems has begun to explore the interdependent and dynamic nature of EE. Work also suggests variation in the types of ecosystems in which entrepreneurs operate. To get a complete picture of differences in EE components, and their fluctuation in strength over space and time, the development of comparative metrics is needed. The primary objective of this paper is to design comparative metrics of EE to provide a more robust comparison of them over time. A secondary objective of this paper is the development of a typology of ecosystems. Combined, these objective provide a more robust means of comparing the evolutionary and interdependent characteristics of EE over time and space.

AN ANALYSIS OF THE VOWELS IN AFRICAN AMERICAN ENGLISH
Zachary Ireland (Michigan State University), Rachel Jansen (Michigan State University), Chase Smitterberg (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 408
Mentor(s): Meisam Arjmandi (Communicative Sciences and Disorders), Laura Dilley (Communicative Sciences and Disorders)

Forty-five million African Americans speak African American English (AAE); however, there has been little research aimed at determining the acoustic-phonetic characteristics that differentiate AAE from Standard American English (SAE). To address this gap, six female speakers, three SAE speakers and three AAE speakers, were selected from a corpus of 30-45 minute sociolinguistic interviews with talkers in the Lansing, MI

area. Vowels in controlled phonetic contexts were identified which were followed by a specific consonant (e.g., /n/, /m/, /l/, /r/). Approximately 10 instances of each vowel and context for each speaker were randomly selected for a total of around 60 tokens. Speech waveforms and spectrograms were then analyzed to measure the first two formants (i.e., natural resonances of the vocal cavity), and fundamental frequency for each token. The first and second formant values were extracted through use of a linear predictive coding (LPC) algorithm with hand-correction by trained analysts. Preliminary results revealed differences in vowel properties between groups of SAE and AAE speakers. These findings show that vowel properties such as formant trajectories may play a role in perception of AAE. Future studies will investigate how specific acoustic properties allow listeners identify racial/ethic background from voice attributes, shedding light on factors that may be tied to bias experienced by talkers in everyday life, including educational, medical, and legal settings.

MEMORY MIXING FOR STIMULUS DURATIONS
Mitchell Isaacs (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 409
Mentor(s): Melissa Allman (Psychology)

The subjective phenomenon that sounds (of a given duration) are judged as longer than lights (of the same duration) has been studied under a wide variety of conditions in humans and animals. The modality effect is not just due to increased attention or a higher clock count accumulated during auditory than visual stimuli (either through a faster pacemaker rate or more effective attentional gating for auditory stimuli). It is supposed the effect arises from the comparison (of a given stimulus modality) to a sample drawn from (an amodal) reference memory which stores memories (or clock counts) from both modalities (i.e., a higher clock count from an auditory stimulus might be compared to a lower visual memory clock count, resulting in a subjective lengthening of the auditory stimulus). The aim of the current study was to further examine the emergence of memory mixing throughout the course of an experimental session (i.e., across different modality distributions in reference memory). We adopted a temporal generalization procedure: A standard stimulus duration (i.e., 5.25-s) was pre-exposed and required to be remembered, then in the training stage, the same stimulus duration, along with different ones (shorter and longer) were presented, and participants were required to judge whether the just-presented duration was the pre-exposed standard ('yes' or 'no; feedback provided). The identity of the stimulus modality (visual or auditory) for the pre-exposed and training phases was manipulated across four blocks within the session (VV/AA/VA/AV). Our findings are discussed.

DRUG USE AND ANTISOCIAL BEHAVIOR
Johnny Jimenez (Northeastern Illinois University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 410
Mentor(s): Sheila Maxwell (Criminal Justice)

The use of illicit drugs has been strongly associated with violent behavior. Existing research indicates that individuals who use illicit drugs are more likely to engage in violent behavior, as compared to those who do not use drugs. However, from 1992 to 2003 research has shown a 212% increase in the use of non-prescribed medications. As a matter of fact non-prescribed medications comprise the second type of drugs used most in the United States, surpassing all illicit drugs except marijuana. The objective of this study is to examine the differences in violent behavior between users of illicit drugs and non-prescription medications. It is expected that illicit drug use will be more closely related to violent behavior than the use of marijuana and non-prescribed drug, but that non-prescribed drug users will also display significant violent behavior. The sample size for this study consists of 26,669 respondents aged 12-25 from the 2014 National Survey on Drug Use and Health data-set. Substance use for this study will be categorized in three different groups (marijuana, illicit drugs, and non-prescribed medication). Analysis will consist of bi-variate, multivariate, and interaction tests. The study seeks to inform the general audience and policy-makers on the behavioral effects of non-prescribed drugs, and assess whether these are as dangerous as other illicit drugs, as well as what the implications are in terms of policy and public health.

RETAIL INTERNATIONALIZATION: THE IMPORTANCE OF NEAR MARKETS IN STRATEGIC EXPANSION
Cara Kaye (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 411
Mentor(s): Brenda Sternquist (Marketing)

In an continuing research effort by Dr. Brenda Sternquist on companies' strategic international retailing expansion patterns, one important factor under consideration in this project that can can influence this expansion pattern is near-market culture. Near market culture, brought up in the early 2000s, puts emphasis on the cultural similarities that are important in successful international retail expansion. This study explores food retailers expanding to near markets that started with countries with similar near cultures in order to create a geographical cluster, and how that near market culture plays a significant role in their strategic expansion planning.

SHOOTER BIAS
Christian Kotoye (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 412
Mentor(s): Joseph Cesario (Psychology)

The study aims to research the effects that class and racial bias has on the decision to shoot unarmed white and black males of varying socio-economic status. Due to the increased media coverage on unarmed young black males being wrongfully shot by white police officers. There has been a spike in the amount of psychological researchers and studies that are devoted to answering why this happens. As a result, there have been multiple studies focusing on the likelihood of someone to shoot an unarmed black vs. shooting an unarmed white male. The results of these studies, overall show there to be a race effect where unarmed black males are more likely to be shot than unarmed white males. Participants of the study viewed pictures of black and white males (targets) in various outfits, based on socio-economic status (Upper and Lower Class), who are holding guns or non-gun objects. Participants viewed series of these pictures and made fast decisions (in under a

second) on whether the object being held by the target is a gun or not by pressing a button on a keyboard marked shoot for guns and a button marked "don't shoot" for non-gun objects. The results of the pilot data of the study showed that there was no race or class effect. This is interesting given the results of other similar studies that find race effects. Moving forward the study plans to continue the research in order to test whether this effect is consistent.

CONSUMER PERCEPTIONS OF FOOD SAFETY AND BRAND LOYALTY: AN ANALYSIS OF CHIPOTLE'S FOODBORNE ILLNESS OUTBREAKS
Caitlyn Kuskowski (The School of Hospitality Business)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 413
Mentor(s): Jae Min Cha (Hospitality Business)

Chipotle Mexican Grill, a popular fast- casual restaurant chain recently endured a year long challenge of multiple foodborne illness outbreaks. A series of foodborne illness outbreaks have been devastating for Chipotle. With stock prices dropping, loyal customers questioning the quality of the food, and bad publicity continues spreads on social media. It is important to understand how the impact of such events can affect brand loyalty and consumer purchasing behaviors given all other outside factors, which play a huge role. In Chipotle's case, the chain has done a lot to try and restore consumer confidence in the safety of its food. Chipotle has engaged in wide-ranging recovery strategies and PR efforts such as burrito coupons and company wide food preparation and sanitation training.The purpose of this study is to study and understand the effects of a widely publicized outbreak of foodborne illness on Chipotle as a whole but also from the consumer standpoint, analyzing their behaviors and brand loyalty.

ORTHOPEDIC PATIENT ADHERENCE AND SATISFACTION IN SPARROW HOSPITAL
David Lawlor (Michigan State University), Adithya Bala (Michigan State University), Maya Giaquinta, (Michigan State University), Megan Penzkofer (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:30 PM - 3:45 PM
Poster: 414
Mentor(s): Daniel Menchik (Sociology)

In the last decade, hospitals across the nation have begun emphasizing the experiences of patients in their care, with low readmission rates and high patient satisfaction as the indicators of an efficient and successful hospital. Sparrow Hospital in Lansing, Michigan observes high surgical volume, but is rated as "below average" in several patient satisfaction categories. With this in mind, researchers entered the Orthopedic Department of Sparrow Hospital in Lansing, Michigan with the goal of determining what factors influence patient readmission, adherence, and satisfaction, and how these measures of quality can be improved. Access to surgical schedules and patients was granted by orthopedic surgeons at Sparrow Hospital. Patients were observed for the entirety of their pre-operative proceedings, and interviewed at 1-, 4-, and 8-week intervals. Fifty-one patients were observed over a period of roughly two years. Exercise and satisfaction data were collected from interviews with many of these patients, as well as data accessed from Sparrow Hospital's electronic medical records. Following the collection of this data, a relationship between adherence to post-operative instructions and satisfaction with the surgery was observed. Patients with concrete goals for recovery that led them to exercise at a high level after the surgery were largely more pleased with their outcomes. This relationship appears to show that higher levels of exercise lead to a more positive recovery, arguing that a patient's satisfaction with his or her outcome leads to satisfaction with the hospital.

HOTEL GUESTS' PERCEIVED IMPORTANCE AND SATISFACTION WITH A GUESTROOM'S INDOOR ENVIRONMENTAL QUALITIES
Kibong Lee (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 418
Mentor(s): Miran Kim (Hospitality Business)

According to the U.S. Green Building Council (2014), "In the United States alone, hotels represent more than 5 billion square feet of space, nearly 5 million guest rooms, and close to $4 billion in annual energy use. Hotels and other hospitality venues have a significant opportunity to reduce negative environmental impacts through energy and water efficiency, waste reduction and management, sustainable and local purchasing, and use of alternative transportation." Hotels can also contribute to human well-being by providing healthy, comfortable, and productive indoor environments with improved indoor air quality, access to daylight and views, and occupant control of the lighting and thermal environment. Hotels can also contribute to guests' well-being by providing healthy, comfortable, and productive indoor environments with improved indoor air quality, access to daylight and views, and occupant control of the lighting and thermal environment. Hotels can also save large amounts of money by adopting sustainability practices by satisfying guests' needs.Therefore, the proposed research is to identify the guests' perceived importance and satisfaction, with a guestroom's indoor environmental qualities such as air quality, lighting quality, thermal comfort, and acoustical quality. The proposed project will further promote economic, environmental, and health benefits of green hotels.

PERCEIVED BARRIERS TO ADDRESSING HIV TO IPV VICTIMS
Tyleen Lopez (St John's University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 419
Mentor(s): Cris Sullivan (Psychology)

Intimate partner violence and its relationship to HIV/AIDs is a serious concern across the globe. Women who are victimized by partners or ex-partners suffer from physical violence, sexual violence, threats of physical or sexual violence, stalking and psychological aggression by a current or former intimate partner. IPV and HIV have strong correlations, which increase the risk of victims contracting HIV/AIDS. Thus, it is imperative that domestic violence (DV) advocates are actively talking to IPV victims and survivors about HIV. However, the agencies which these DV advocates work for may have policies/ practices in effect which determine how DV advocates are able to address HIV to IPV victims. In order to address this issue, the current study involved an online survey which was sent to DV advocates across the United States and U.S. territories.

Approximately 700 DV advocates took this survey and shared their common knowledge and perceived barriers related to addressing HIV/AIDs with IPV survivors. The results of the survey increased our understanding of the limitations DV advocates face when addressing HIV/AIDs. Hopefully, the findings of this study will help educate DV advocates about how to discuss HIV to IPV victims in order to provide better services to IPV victims.

HOW DOES PROPANE DEMAND RESPOND TO PRICES AND WEATHER?
Zachary Luther (University of Minnesota-Twin Cities)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 420
Mentor(s): Soren Anderson (Economics)

How propane demand responds to prices and to weather has important implications for market projections, energy security, and pricing regulations, among other factors. In this paper, we estimate how U.S. propane demand responds to prices, heating degree days (a measure of demand for heating), and precipitation during the Midwest agricultural crop harvest season (a measure of demand for crop drying). We initially document a strong, positive correlation between precipitation and heating degree days during the fall on propane prices during the winter; we show that this correlation is driven by above-average depletion of propane stockpiles during the fall, which thereby leads to higher prices during the winter. We then use two-stage least squares (2SLS) regression methods to identify the all-else-equal effect of winter propane prices and heating degree days on the quantity demanded during the winter heating season, instrumenting for winter prices with off-season weather. Initial results indicate that winter propane demand is insensitive to prices but highly responsive to extreme cold weather events. These results have important implications for propane market policy—analysts will be better able to forecast prices as a function of weather and the overall quantity supplied. Furthermore, these results provide further insight into the domestic market—although the propane market is currently small relative to other fuels, propane is an important heating fuel source for millions of households across the United States, and the market is anticipated to grow with the recent boom in shale gas production.

DISORDERED EATING SCREEN FOR ATHLETES (DESA-6): A PROPOSED SELF-REPORT BRIEF SCREENING TOOL FOR DISORDERED EATING IN ATHLETES
Ryley Mancine (Michigan State University), Peter Stephan (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 421
Mentor(s): Samantha Kennedy (Psychiatry)

Disordered eating (DE), a subclinical spectrum of abnormal eating behaviors that can lead to eating disorders (EDs), is a growing problem among athletes that adversely affects physical and mental health as well as athletic performance. EDs are associated with increased risk for many mood, anxiety, impulse-control and substance use disorders, and have an extremely high mortality rate. Screening tools exist to diagnose these disorders, but these tools are designed only for females. Our research hopes to develop a screening tool, the Disordered Eating Screening for Athletes (DESA-6), which consists of only 6 items and is designed to identify adult athletes of both genders and all ages who are at risk for disordered eating and evaluate reliability, internal consistency and discriminants as well as concurrent validity. Male and female adult athletes over the age of 18 were recruited through the MSU Sports Medicine Clinic in East Lansing, MI. Athletes of all sports were included in data collection. Participants were issued a survey that consisted of three brief sections and which often took less than 5 minutes to complete. In the first section, athletes were asked demographic information including age, primary sport, height and current weight. The second section contained the DESA-6, and the third section consisted of the EAT-26, which is a reliable self-report questionnaire assessing the risk of disordered eating. No identifying information was collected throughout the questionnaires. Analysis hopes to prove reliability, internal consistency an discriminants as well as concurrent validity of the DESA-6 in relation to the EAT-26.

USING THE SOCIAL BEHAVIOR AND EXPERIENCE INVENTORY (SBEI) TO UNDERSTAND DIFFERENTIAL PREDICTION ACROSS RACE AND FIRST GENERATION STATUS
Sergio Marquez (Florida International University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 422
Mentor(s): Christopher Nye (Psychology)

Universities around the nation are expanding and broadening their values, becoming further aware of the culture student's face within their own campus. As a result, universities are realizing that High school GPA (HSGPA) and SAT/ACT admission scores are no longer sufficient to predict student success within their institution. Research has shown that SAT/ACT scores may cause a phenomenon known as differential prediction, in which regression equations predicting important performance criteria are found to differ across groups (i.e., Males vs. Females), hinting at a possible bias within the test. Research has also investigated differential prediction by examining other variables that may account for this difference in validity, such as personality factors or course taking patterns, finding that these other, non-measured variables can significantly account for differential prediction. The goal of the present study is to investigate differential prediction across racial/ethnic groups (White, Black, Asian) and for first generation students using admission scores from applicants to Michigan State University. Through multilinear regressions, using HSGPA, SAT/ACT from incoming freshman classes and binary grouping variables for race and first generation status as predictor variables, we will examine bias in the prediction of first-year GPA. In addition, using data on the Student Behavior and Experience Inventory (SBEI), we will also investigate which factors further account for differential prediction across models with added SBEI factors, and whether the SBEI (non-cognitive) scales provide incremental validity for HSGPA and ACT/SAT scores (cognitive factors) for college admissions.

ENDING THE PINK TIDE?: WELFARE SPENDING AND GOVERNMENT APPROVAL IN POPULIST LATIN AMERICA
Cristian Eduardo Martnez-Medina (University of Puerto Rico-Rio Piedras)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 423
Mentor(s): Erica Frantz (Political Science)

Since Hugo Chavez's ascension to power in 1999, populism has been on the rise in many parts of Latin America, a phenomenon often referred to as the Pink Tide. Candidates promoting populist rhetoric were victorious at the polls in countries ranging from Ecuador to Brazil. Central to much of this agenda has been an emphasis on welfare spending. This study examines the effect of welfare spending on government approval rates among Pink Tide governments. Though it is reasonable to expect that higher welfare spending will lead to more popular governments, this has yet to be empirically examined in the literature. It is also possible, for example, that higher welfare spending early on increases approval rates, but that this effect diminishes as time in office increases. This study assesses these possibilities. To do so, it looks at the relationship between welfare spending and government approval rates during the tenures of 16 populist Latin American presidents in 9 countries since 1999. The findings of this study will inform our understanding of the extent to which populism and welfare spending specifically has been an effective strategy for generating political support in Latin America. Understanding this data will help to understand the populism governments and its strategies to maintain power. Also the results will give information about the function of the Pink Tide movements, and its structures. The conclusions of this study will let know if Latin American is near to a massive change of ideology.

TRANSCRIPTION AND ITS PRODUCTS CHALLENGES STUDENTS' COMPREHENSION OF THE FLOW OF GENETIC INFORMATION
Alexandria Mazur (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:30 PM - 3:45 PM
Poster: 424
Mentor(s): John Merrill (Microbiology & Molecular Genetics), Rosa Moscarella (CREATE4STEM), Mark Urban-Lurain (CREATE4STEM)

Genetics is a fundamental concept for biology literacy, yet many students struggle to understand its processes. The flow of genetic information at the molecular level are particularly challenging for students. To help students overcome these difficulties, instructors should understand the alternate conceptions students hold. The Automated Analysis of Constructed Response research group investigates the computerized analysis of students' writing. The present work is based on students' written responses to questions about the effects of a mutation on processes of genetic information flow: replication, transcription, and translation. Analysis of responses before and after a case study about a genetic disorder revealed that a large number of incorrect responses persisted for transcription compared to replication and translation. This motivated us to conduct 19 semi-structured interviews of undergraduate introductory biology students. Explaining the role of mRNA in transcription was particularly challenging for these students. Based on student interviews and literature, we characterized three patterns of students' understanding of mRNA's role in transcription: mRNA synthesized elsewhere and participates in transcription, mRNA is converted from DNA, and mRNA is the product of transcription. We interviewed 35 additional undergraduate students, including upper-division students, about mRNA synthesis. We found no new alternative conceptions; nonetheless, alternative ideas about mRNA were still remarkably persistent in upper division students. These findings illuminate how and why students struggle with transcription: they have difficulty explaining the mechanism of transcription and mRNA's role in the process. We suggest instructors focus on transcription as a key concept to understanding the flow of genetic information.

A LONGITUDINAL EXAMINATION OF LANGUAGE DEVELOPMENT BY GENDER
Alexa Meier (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 2:30 PM - 3:45 PM
Poster: 427
Mentor(s): Hope Gerde (Human Development & Family Studies)

Previous research has established that young girls develop language earlier and at a faster rate than boys (Bouchard et al., 2009). Girls demonstrate better linguistic skills even from a young age, including onset of the first words, and producing more words and longer sentences than boys (Bouchard et al., 2009). By age three, girls appear to be ahead of boys, and their superior verbal skills could give them increased access to their social environment (Bouchard et al., 2009). However, previous cross-sectional research has shown that by elementary school, boys and girls no longer demonstrate these differences (Bouchard et al., 2009). This study will further examine gender differences in language development, using longitudinal data to identify this relation across time. The database used in this study contains narrative data for over 300 diverse children at age preschool, kindergarten, first, and second grades. Narrative data was collected using the Narrative Assessment Protocol (NAP; Pence, Justice, & Gosse, 2007) in which an assessor reads a wordless picture book to the child and the child engages in a retelling of the story. This narrative is then coded for various components of language. Total scores on NAP will be used to show that ample variation exists by gender. Data analyses will describe the growth of children's language skills from preschool through second grade, examine the difference between boys and girls on this growth, and consider where the girls' advantage begins to dissipate.

SEX AND DRUGS: AN INVESTIGATION INTO THE EARLY PREDICTORS OF SEXUAL DEBUT AND SUBSTANCE USE INITITATION
Billy Rodriguez (St Mary's University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 2:30 PM - 3:45 PM
Poster: 428
Mentor(s): C. Emily Durbin (Psychology)

Early sexual debut is associated with negative outcomes such as sexual health issues, early substance use, and emotional stress. In addition, early substance use initiation has been associated with early sexual debut and physical and mental health issues. Despite this knowledge, the direct relationship between sexual debut and initiation of substance use is unknown. This study will investigate the relationship between sexual debut and substance initiation. Specifically, the experimenters will investigate early predictors of both sexual debut and substance use initiation and evaluate if any intersectionality exists between the two. The experimenters will use a secondary dataset from the Michigan Longitudinal Study and analyze it using Pearson Product Moment Correlations and Linear Regressions. The Michigan Longitudinal Study dataset is a dataset that spans over three generations of families. In addition to asking about sexual behavior and substance use, the Michigan Longitudinal Study asks about a participant's behavior using parent, teacher, and self-reports. Identifying shared early predictors will allow for the development of intervention programs to prolong sexual debut and substance use initiation in at risk populations. Even though this study will be correlational in nature, by finding common early predictors the researchers could eliminate the possibility of a third unknown variable moderating the relationship between the two variables.

WHY DO CERTAIN MEN WHO HAVE SEX WITH MEN (MSM) NEGLECT TO TEST FOR HIV?
Ervin Simmons (Southern University at New Orleans)
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 2:30 PM - 3:45 PM
Poster: 429
Mentor(s): Todd Elder (Economics)

The Centers for Disease Control and Prevention (CDC) recommends that gay, bisexual, and other men who have sex with men (MSM) undergo HIV testing once a year at minimum because knowledge of HIV-status reduces HIV transmission rates (CDC 2013). Research suggests that many young black MSM disregard this recommendation as they constitute more new infections than any alternate subgroup by sex, race/ethnicity, and age (CDC 2015). This research is meant to precisely determine how many black MSM aged 18-24 have ever tested for HIV, and the top three reasons why black MSM aged 18-24 who have never tested for HIV neglect to get tested. We accomplish this by using Stata 13.1 to analyze data from the CDC's 2014 National Health Interview Survey. Our results are important because young black MSM are responsible for 55% of new HIV infections among young MSM, and 50% of black MSM are expected to contract HIV in their lifetime.

IS ARMING PRIVATE SECURITY GUARDS IN THE US A GOOD IDEA? AN ASSESSMENT OF STATE REGULATORY STANDARDS IN THE UNITED STATES
Gloria Tabaczyk (Michigan State University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 2:30 PM - 3:45 PM
Poster: 430
Mentor(s): Mahesh Nalla (Criminal Justice)

Research suggests that the security guard industry has grown significantly in many parts of the world, particularly in emerging markets and new democracies. Though private security guards engage in some duties that resemble police work which brings them in close contact with private citizens, research in Europe and North America suggest weak standards and regulation relating to Security Guard industry relative to police work. Very little is known about the nature of security guard regulations and how they compare with existing legislative framework in Europe and the Americas. Thus the aim of this study is assess private security guard industry regulation in Asia. More specifically, we examine legislation as it relates to minimum standards for recruitment, training, and legal authority.

THE VICARIOUS EFFECTS OF DISCRIMINATION -HOW PARTNER EXPERIENCES OF DISCRIMINATION AFFECT INDIVIDUAL HEALTH
Nyla Wofford (Prairie View A&M University)
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 2:30 PM - 3:45 PM
Poster: 431
Mentor(s): William Chopik (Psychology)

Experiencing discrimination is associated with harmful physiological and psychological effects such as chronic illness and depression. Previous research placed a narrow focus on the effects of discrimination on individual health and well-being. However, less is known about how discriminatory experiences indirectly affect interpersonal relationships - specifically romantic partners who do not directly experience discrimination. A total of 1,949 couples (3,898 participants) were given a survey assessing their experiences of discrimination, depression, physical health, and chronic illnesses. Using dyadic data analyses, we examined actor and partner effects of experiencing discrimination (e.g., race, age, gender) on incidences of depression, subjective health, and chronic illness. Actor discrimination was associated with poorer health, more chronic illnesses, and greater depression. Further, having a partner who experienced discrimination was also associated with poorer health, more chronic illnesses, and greater depression. Supplementary analyses revealed racial discrimination presented stronger vicarious effects on health and well-being than other forms. For health and depression, there were significant minority couple × partner discrimination interactions compared to couples with two white partners. Our findings provide insight into the effects of discrimination on interpersonal relationships and motivate additional studies on potential risk factors associated with poor health.

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