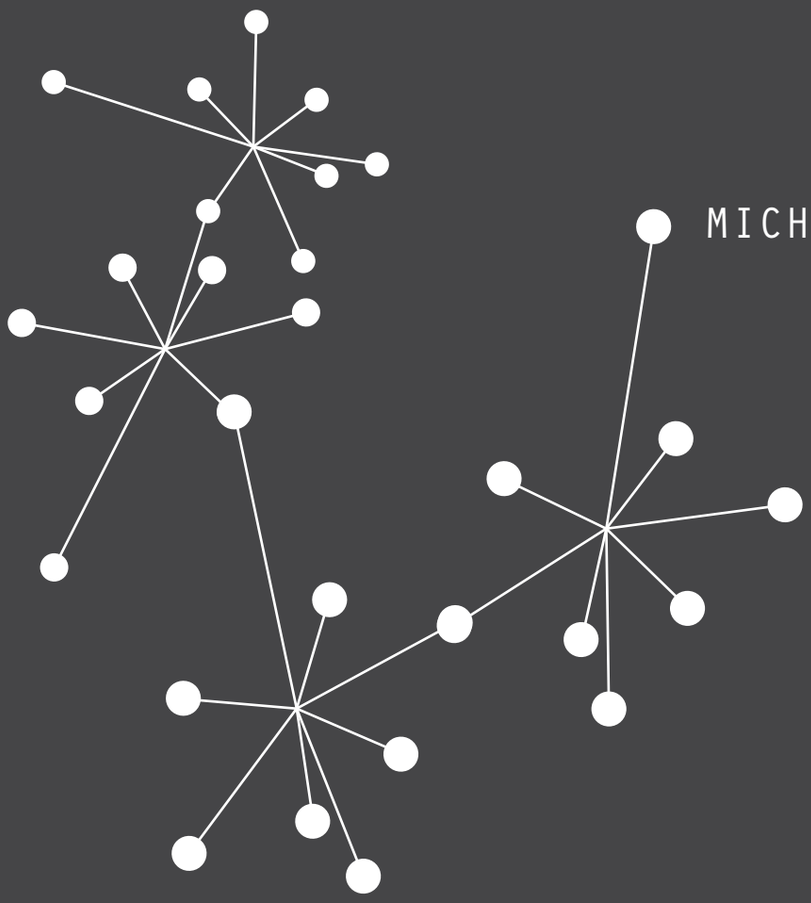

MICHIGAN STATE UNIVERSITY

SUMMER UNDERGRADUATE *research and arts* FORUM

July 24, 2012

Second Annual
Michigan State University
Summer Undergraduate Research Forum
July 24, 2012

Welcome to the second Summer Undergraduate Research Forum (SURF) at Michigan State University. Undergraduate students from diverse academic disciplines will present their outstanding research and creative endeavors. Approximately 230 students from MSU and visiting students from 57 institutions are participating in today's event. These students are mentored by 219 faculty members and graduate students.

As one of the nation's leading research institutions, MSU offers a breadth of experiences and opportunities that actively engages 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, mentors, and our 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.

This program was a collaborative effort between the Undergraduate Research Office, the Graduate School's Summer Research Opportunities Program (SROP), The College of Engineering, and the BEACON Center for the Study of Evolution in Action.

MICHIGAN STATE
UNIVERSITY

Undergraduate Research at Michigan State University

Undergraduate Research Initiative

Michigan State University's **Undergraduate Research Initiative** strives to increase opportunities for students to engage in scholarship, expand the pool of faculty and partners engaging undergraduate students in their scholarly work, and better understand the impact of this engagement on student learning and retention. Nearly one-third of MSU seniors have had a research experience with a faculty member. Research and creative activity opportunities are available in each of the 14 colleges that award undergraduate degrees. Our annual undergraduate research and arts forum, held each April, is one of the largest in the nation. Professional development workshops and travel grants for research presentations are available to undergraduate researchers. For more information about the undergraduate research initiative, contact Dr. Korine Wawrzynski at steinke7@msu.edu

Engineering Summer Undergraduate Research Experience

The Michigan State University College of Engineering **Summer Undergraduate Research Experience** (EnSURE) is designed to engage high achieving students in faculty-mentored research. Students are paired with faculty in one of six engineering departments: Biosystems & Agricultural Engineering; Chemical Engineering & Materials Science; Civil & Environmental Engineering; Computer Science & Engineering; Electrical & Computer Engineering; Mechanical Engineering. Typically, students engage in 10 weeks of full-time research activities, ranging from "bench science" in a laboratory to on-site field work and computational modeling. Students are exposed to a variety of research activities, such as experimental design, data collection and analysis, modeling, simulation, and various types of computational science and interdisciplinary engineering research. In addition to their research activities, students participate in weekly professional development activities designed to help students understand and prepare for graduate studies. For more information, contact Dr. Katy Colbry, Director of Graduate Recruiting, at colbryka@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 undergraduate students who pursue graduate study and careers in teaching and research at colleges and universities. The program helps to prepare undergraduate students for graduate study through intensive research experiences with faculty mentors and academic enrichment activities that give students a competitive advantage. For more information, contact the Graduate School at msusrop@grd.msu.edu.

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.

Table of Contents

Schedule at a Glance

8:30 AM – 9:15 AM	Registration
9:15 AM – 10:30 AM	Early Morning Poster & Oral Presentations
10:30 AM – 10:45 AM	Break
10:45 AM – 12:00 PM	Late Morning Poster & Oral Presentations
12:00 PM	Picnic, Engineering Courtyard (Rain Location: 1345 EB)

Poster Presentation Schedule

All posters will be located in the 1st floor of the Engineering Building

Early Morning Posters 9:15 AM – 10:30 AM	**Late Morning Posters 10:45 AM – 12:00 PM**
Biological Sciences, Sections 1, 2, & 3	Biological Sciences, Sections 4, 5, & 6
Biosystems and Agricultural Engineering, Section 1	Biosystems and Agricultural Engineering, Section 2
Chemical Engineering and Materials Sciences, Sections 1, 2, & 3	Chemical Engineering and Materials Sciences, Sections 4 & 5
	Civil and Environmental Engineering, Section 1
Computer Science and Electrical Engineering, Sections 1 & 2	Computer Science and Electrical Engineering, Section 3
Mechanical Engineering, Sections 1 & 2	Mechanical Engineering, Sections 3 & 4
Natural Science, Section 1	Natural Science, Section 2
Social Science, Section 1	Social Science, Section 2

Oral Presentation Room Assignments

EB = Engineering Building
ANH = Anthony Hall
Maps are located at the back of the book

Early Morning Oral Presentations, 9:15 AM -10:30 AM

Category	Room Location
Agriculture, Animal Sciences and Environmental Resources, Section 1	1145, EB
Biological Sciences, Section 1	2108, EB
Biological Sciences, Section 2	2219, EB
Biological Sciences, Section 3	2250, EB
Biological Sciences, Section 4	3405A, EB
Biological Sciences, Section 5	3405B, EB
Computer Science and Electrical Engineering, Section 1	1234, EB
Engineering, Section 1	3540, EB
Natural Science, Section 1	1260, ANH
Social Sciences, Section 1	1345, EB
Social Sciences, Section 2	3546D, EB
Social Sciences, Section 3	1235, ANH
Social Sciences, Section 4	1255, ANH

Late Morning Oral Presentations, 10:45 AM – 12:00 PM

Category	Room Location
Agriculture, Animal Sciences and Environmental Resources, Section 2	1145, EB
Biological Sciences, Section 6	2108, EB
Biological Sciences, Section 7	2219, EB
Biological Sciences, Section 8	2250, EB
Biological Sciences, Section 9	3405A, EB
Computer Science and Electrical Engineering, Section 2	1234, EB
Computer Science and Electrical Engineering, Section 3	3405B, EB
Engineering, Sections 2	3540, EB
Natural Science, Section 2	1260, ANH
Social Sciences, Section 5	3546D, EB
Social Sciences, Section 6	1235, ANH
Social Sciences, Section 7	1255, ANH

Abstracts

Abstracts are organized by discipline and then by presentation time or poster number within each category. Oral presentations are listed first followed by poster presentations. An index of student presenters is located at the back of the program book.

Agriculture, Animal Sciences and Environmental Resources

Oral Presentations

HATCHING HABITS OF THE PLUM CURCULIO
Robbert Arder, Redi Shorter
Home Institution(s): Crescent Academy, Detroit School of Arts
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 9:15 AM
Mentor(s): Willye Bryan (Entomology)

In the field of Entomology, two high school research assistants are developing larvae into PCs (Plum Curculio). PCs are insects, weevils, closely related to beetles that hatch their eggs in fruits, which damage the harvest of many crops such as apples. The Pesticide Alternatives Lab is committed to pesticide reduction; the purpose of this research project is to determine effective pesticide alternative control methods. Strains of PCs are being studied to establish behavior and hatching habits.

EVALUATING THE EFFECT OF BLANCHING AND CALCIUM CHLORIDE ON COLOR, TEXTURE AND ANTIOXIDANT CAPACITY IN CANNED ASPARAGUS
Angela Davis
Home Institution(s): Alabama Agricultural and Mechanical University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 9:30 AM
Mentor(s): Dalbir Sogi (Food Science and Human Nutrition), Muhammad Siddiq (Food Science and Human Nutrition)

Total antioxidant capacity is the cumulative capacity of food components to scavenge free radicals. Antioxidant capacity in the stems of asparagus affects the chemical and physical quality of canned asparagus such as the phenolics, texture, and color, which will also be measured. Canned asparagus may offer more nutrients per dollar than fresh, frozen, or dried asparagus. It may also reduce the amount of waste that consumers create on a day-to-day basis. The purpose of this study is to determine whether antioxidant capacity in raw asparagus stems increases after implementing four different canning methods. The treatments include: steam blanching with calcium chloride, steam blanching without Calcium, water blanching with calcium chloride, and water blanching without Calcium. One of the methods being utilized is the trolox equivalent antioxidant capacity method (TEAC) carried out using the 2'-azinobis 3-ethyylbenzothiazoline-6-sulfonic acid (ABTS) decolorization assay. TEAC measures the antioxidant capacity of asparagus, as compared to the standard, Trolox. Other antioxidant capacity assays I will use include the diphenylpicrylhydrazyl method (DPPH), oxygen radical absorbance capacity fluorescein method (ORAC), and the ferric reducing antioxidant power method (FRAP). After conducting my research I am hoping to find an increase in antioxidant capacity. If there is an increased level of antioxidant capacity the asparagus can be used for the extraction of phenolics, which can result in a reduction of oxidative damage diseases.

THE IMPACT OF TRANSPOSABLE ELEMENTS ON THE GENOME EVOLUTION
Danielle Epps
Home Institution(s): Michigan State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 9:45 AM
Mentor(s): Ning Jiang (Horticulture)

Transposable elements are sequences that can move from one locus to another while increasing their copy numbers in the genome. Pack-MULEs refer to Mutator-like elements carrying gene or gene fragments. Pack-MULEs are abundant in plant genomes, and may affect the expression of their parental genes. Mutator elements are the founder elements of Pack-MULEs and have been known to acquire fragments of cellular genes and are still actively amplifying in the genome. However, it is not clear whether the copy number variation caused by their amplification has any impact on their parental genes. To test this notion, we collected samples from maize plants containing distinct copy numbers of Mutator elements, and we will measure the RNA level of the parental gene in these plants. Through this experiment, we intend to determine the relationship between copy number of Pack-MULEs and the expression level of their parental genes. This research project deals with DNA and RNA of maize, and looking to discover more about the transposable elements within this crop on the genome evolution.

ROLE OF MAST CELL HETEROGENEITY IN FOOD ALLERGY
Yingli He
Home Institution(s): Michigan State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 10:00 AM
Mentor(s): Venugopal Gangur (Food Science and Human Nutrition)

BACKGROUND: Food allergy is a growing and critical public health problem. Allergies in general are mediated by IgE antibody sensitized mast cells. There is growing evidence that mast cells are heterogeneous and subsets of mast cells have potentially different functions. The specific role of mast cell heterogeneity in food allergy is not well understood at present. HYPOTHESIS: We hypothesize that only gut mast cells participate in allergic reaction in a mouse model of food allergy developed by Dr. Gangur and his colleagues (Birmingham et al 2007; Parvataneni et al 2009; Gonipeta et al 2010). METHOD/APPROACH: Mice will be sensitized to food allergens and their sensitivity confirmed by measuring IgE antibody and anaphylactic responses to oral allergen exposure. Mast cell phenotype and response to food allergen will be studied in the intestinal tissues and compared to the mast cell phenotype and response in non-intestinal tissues such as skin and heart. Tissue sections will be stained for mast cell specific stain and analyzed using established methods. EXPECTED RESULTS AND SIGNFICANCE: It is our hypothesis that only gut mast cells respond to the food allergen. Therefore, we expect that whereas intestinal mast cells will respond to food allergen, mast cells in skin or heart will not show such changes. If our hypothesis is supported, it would imply that therapeutic strategies for food allergy must specifically target intestinal mast cells. This study will also shed light on the role of mast cell heterogeneity in food allergy in general.

PHENOTYPIC VARIATION IN VISUAL SIGNALS OF MALE STICKLEBACK FISH AT DIFFERENT POPULATION DENSITIES
Kyle Lewis
Home Institution(s): Morehouse College
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 10:15 AM
Mentor(s): Janette Boughman (Zoology), Robin Tinghitella (Zoology)

Many organisms exhibit signals to potential mates for sexual selection and in order to complement their fitness. Male stickleback fish (gasterosteus spp.) display elaborate varieties of phenotypes and behaviors in order to attract their mates. These phenotypic variations include red chins, and various eye and body colors. This provoked the question of whether or not male stickleback fish undergo changes of phenotypic plasticity in visual signals, based on the population density that the fish are living in. In other words, do signals differ across habitats that differ in fish number and intensity of male-male competition? We hypothesized that there may also be phenotypic

variations among different population densities of male stickleback fish. To test this hypothesis, we established 'kiddie pools' that contained a high population density of males (6) and a low population density of males (3). Each male was individually marked, color scored, massed, and measured prior to entering their respective pools. Each day, these pools were enticed with a female stickleback fish in order to encourage nest building and male competition in each pool. We expect these to be correlated with phenotypic variation among the male stickleback fish in their various population densities. After approximately 2 weeks, each male was then post phenotyped. We expect males from high density pools to have a great deal of male-male competition and phenotypic variation, and males from low density pools to have lesser deal of male-male competition and phenotypic variation. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

TO GET TO THE OTHER SIDE: THE ROLE OF ROADS, LANDSCAPE, AND SEASON IN ROAD CROSSING BEHAVIORS OF DEER

Kyle Seewald
Home Institution(s): Michigan State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 2
Location: 1145 EB, 10:45 AM
Mentor(s): David Williams (Fisheries and Wildlife)

While there are many features of the landscape that influence movement of and potential disease spread among wildlife populations, roads are of particular interest due to their pervasive presence across the landscape, and applicability to management actions via their role as property and political landmarks. Road network geometry influences animal distributions, movement, and contacts by altering landscape composition and configuration. Roads also function as a major source of mortality for wildlife populations, and mortality rates are significantly influenced by traffic volume, speed limit, and the surrounding landscape characteristics. We are using GPS data from 92 collared white-tailed deer (Odocoileus virginianus) captured within 2 study areas in central New York over a 2-year period to investigate the role of roads as barriers to movement. We are testing hypotheses about the seasonal influence of different road types, the surrounding landscape, and their interactions using comparisons of observed crossing distributions and distributions based on movement simulations. We simulate deer movements using empirically parameterized steplength and turnangle distributions and season-specific step selection models. Our results will have implications for the role of roads as potential barriers to movements and disease spread. If probabilities of crossing and hence contact are greatly reduced across certain road categories, managers with a point of occurrence and a map would quickly be able to limit efforts in areas of the landscape where contacts with the infected individual are unlikely to have occurred.

DEVELOPMENT AND TESTING OF RECOMBINANT HUMAN IL – 2 IN TRANSGENIC CORN

Patrick Thomas
Home Institution(s): Pennsylvania State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 2
Location: 1145 EB, 11:00 AM
Mentor(s): Mariam Sticklen (CSS), Thang Nguyen (CSS)

This research seeks to determine if human interleuken 2 (IL – 2) could be developed and expressed in Zea mays. The genes were initially transferred through pollination (self-pollination or cross-pollination) or bombardment (tissue cultures). After the plants were bred and multiple generations were grown, PCR, electrophoresis and Western blot testing were done to determine whether or not the genes were present or if they were expressed. Through PCR, it was determined that the plants were successful in holding the trait and showed positive bands through PCR and gel electrophoresis. The plants that tested positive for IL-2 were then grown in varying salt concentrations (100mM, 200 mM and 300 mM) to determine the transgenic crops' ability to grow in adverse conditions. Western blot testing was also done to determine if the gene was being expressed in the crop. It was determined that some plants were successful in expressing the gene, but not in a clean manner. This research helps to form the belief that it is possible to purify the gene further and remove any unwanted proteins from samples collected for commercial use.

CHEMR23 RECEPTOR SIGNALS THROUGH PRO-CONTRACTILE SIGNALING PATHWAYS
Rosa Torres
Home Institution(s): Michigan State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 2
Location: 1145 EB, 11:15 AM
Mentor(s): Stephanie Watts (Pharmacology and Toxicology), Elahé Crockett (Medicine)

Chemerin is a peptide that is secreted as a prochemerin from visceral fat, fat around arteries and the liver. Chemerin activates ChemR23, which is a G-Protein linked receptor on vascular smooth muscle, to elicit contraction when endothelium is damaged or removed. The signaling process of ChemR23 receptor in the vascular smooth muscle is completely unknown. Therefore, we tested the hypothesis that the ChemR23 receptor signals through pro-contractile signaling pathways. The thoracic aorta from female Sprague-Dawley rats was used. The periadventitial fat and the endothelium were removed so that signaling reflected primary that of the smooth muscle. Aortic rings were placed in an isolated tissue bath where isometric contraction was measured. We first contracted tissues with the adrenergic agonist Phenylephrine to test that the tissues were living, and then tested for removal of the endothelium. Tissues were then incubated with either an inhibiter or a vehicle for one hour. A cumulative concentration response curve to Chemerin-9 was performed. The calcium channel antagonist nifedipine caused the greatest reduction in maximum contraction (% vehicle contraction=47%). LY294002, a phosphoinoside-3 kinase inhibitor, reduced maximum contraction by 28%, while the RhoKinase inhibitor Y27632 reduced contraction by 20% in vehicle contractions. There was a 19% reduction by the Erk MAPK inhibiter PD098059. 4- Hydroxy Tempol, a radical scavenger did not significantly affect chemerin -9 induced contractions. These findings suggest the ChemR23 receptor through pro-contractile signaling pathways. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

CAUSE AND EFFECT OF ARABIDOPSIS ON A MOLECULAR LEVEL.
Donte Verrill-Huffman, Jordan Pearson
Home Institution(s): Michigan State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 1
Location: 1145 EB, 11:30 AM
Mentor(s): Steve Van Nocker (Horticulture), Miguel Flores, Roshan Angoshtari

Our research on Arabidopsis plants has shown that mutant plants are starting to bloom early. We will be mapping one of the genes (VIP7) and show its relationship to the mutation.

COMPLEMENTATION OF CHLAMYDOMONAS MUTANT A10
Milton Williams
Home Institution(s): Fort Valley State University
Category: Agriculture, Animal Sciences and Environmental Resources, Section 2
Location: 1145 EB, 11:45 AM
Mentor(s): Bensheng Lui (Plant Biology)

Chlamydomonas reinhardtii is a species of microalgae used in laboratories as a model organism for genetic and biochemical studies. Due to its widely known genome it is an ideal candidate for genetic manipulation and can provide more information into the use of microalgae as a source of bio-fuel. Triacylglycerol (TAG) is a type of lipid which has an abundance of energy compared to ethanol and carbohydrates. It is able to be used as bio-fuel and can be introduced directly into engines with little to no further treatment, which gives it a major advantage over ethanol. Studies have shown that under certain stresses, such as nitrogen deprivation, chlamydomonas accumulate high levels of TAG. Chlamydomonas strain A10 is a mutant strain with roughly 7K base pairs missing from its genetic sequence due to the random insertion of plasmids. Three genes are impacted in A10, leading to a low oil phenotype and a growth rate estimated to be half that of wild type strain. Genes deficient in mutant strain were transformed back to A10 individually in order to complement the mutant phenotype. Lipid analysis was performed to compare the TAG level between wild type and mutant algae.

Biological Sciences

Oral Presentations

BIOLUMINESCENCE IN VIBRIO HARVEYI: A STUDY ON THE BREAKDOWN OF QUORUM SENSING
Alani Adkins
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 1
Location: 2108 EB, 9:15 AM
Mentor(s): Chris Waters (Microbiology and Molecular Genetics)

Bacteria communicate through chemical signals, which have been postulated to help the cells determine the presence of others. One such way this is done is through a process called quorum sensing (QS), whereby many genes are regulated in a density-dependent manner. When cells reach high density, they can perform functions that are low density. QS regulates the expression of many genes, including those involved in certain types of virulence, and has thus been proposed as a potential target for disease prevention. This also includes genes encoding products important for many social, multi-cellular behaviors, such as biofilm formation. Such behavior can be costly to cells and subject to breakdown by defection over the course of evolution, making its persistence difficult to explain. We will track the persistence of QS in populations of the marine bacterium *Vibrio harveyi* by monitoring bioluminescence, a QS-regulated behavior, through experimental evolution. The *ΔluxO* strain, which has QS constitutively turned on, will be serially passaged in a nutrient rich complete media and a relatively nutrient poor media. The *ΔluxO* strain will also be competed against wild type and other QS-variant strains to assess the costs and benefits involved in QS-mediated behaviors, as well as where they may break down. This study will provide information regarding the evolution of QS and potentially aid its use as a target for therapeutics. Knowing the speed and frequency of QS breakdown in different nutrient environments would aid in determining how to disrupt QS in natural systems.

SEROTONIN DECREASES RHOA ACTIVATION IN CACO-2 CELLS
Shanice Akoto
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Location: 2108 EB, 9:30 AM
Mentor(s): Mark Kadrofske (Pediatrics), Elahé Crockett (Medicine)

Enterocyte migration is important for intestinal wound healing and maintenance of epithelial barrier integrity. Serotonin (5-Hydroxytryptamine, 5-HT) increases enterocyte actin cytoskeleton organization and migration but its mechanism of action is unknown. RhoA is a low molecular weight GTPase intracellular signaling molecule and a key regulator of actin cytoskeleton dynamics and cell migration in various cell types. It is unknown whether 5-HT regulates RhoA activity in the enterocyte. We have examined the effect of 5-HT on RhoA activation in the enterocyte-like Caco-2 cell. Caco-2 cells were incubated with 100 nM 5-HT for various times and whole cell lysates were affinity precipitated with a rhotekin-GST fusion protein linked to glutathione-agarose beads. The affinity precipitated fraction was analyzed by SDS-PAGE followed by either Coomassie Blue staining or immunoblotting with a rabbit anti-RhoA antibody. Immunoblots were quantified by densitometry. To determine specificity of the affinity precipitation, lysates were incubated with GTPYS or GDP to enrich the activated (RhoA-GTP) and non-activated (RhoA-GDP) forms. Several proteins with molecular weights ranging between 10-40 kDa are affinity precipitated from Caco-2 whole cell lysates. The anti-RhoA antibody identifies a single band at 23 kDa, consistent with the molecular weight of the RhoA protein. The affinity precipitation is specific for RhoA-GTP as compared to RhoA-GDP. Stoichiometric analysis of the total, bound and unbound fractions demonstrates adequate recovery of the bound fraction and lack of saturation of bound RhoA-GTP. Treatment of Caco-2 cells with 5-HT showed a transient decrease in RhoA-GTP at 5 minutes with a subsequent increase above baseline levels by 10 minutes. RhoA-GTP levels were decreased at one and two hours after exposure to 5-HT. We have established a method to

quantitate activated RhoA (RhoA-GTP) in whole cell lysates from Caco-2 cells. Our preliminary results suggest that 5-HT may mediate actin cytoskeleton changes and enterocyte migration through changes in RhoA activation. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

EFFECTS OF BISPHENOL-A EXPOSURE ON PROLACTIN LEVELS IN FEMALE RATS
Keith Ameyaw
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Location: 2108 EB, 9:45 AM
Mentor(s): Sheba Mohankumar (Pharmacology and Toxicology)

Bisphenol-A (BPA), a compound commonly used in the synthesis of plastics, is present widely in the environment as a pollutant. BPA is believed to be an endocrine disruptor because it binds to estrogenic receptors interfering with estrogen-dependent functions. Estrogen has been found to increase prolactin (PRL) levels by decreasing dopamine (DA) in the brain. It is known that elevated PRL levels contribute to the development of mammary tumors. Because of BPA's estrogen-like properties, we hypothesize that it will affect hypothalamic DA through mechanisms similar to estrogens, increasing PRL levels. To test this, adult female rats were treated intraperitoneally with saline, 10µg or 100µg of BPA once a day for two weeks. At the end of treatment, animals were sacrificed, their brains removed, frozen and sectioned. Trunk blood was collected and serum was stored at -70°C until assayed for hormones using radioimmunoassay. The caudate putamen (CP) and the median eminence (ME), regions of the brain where DA terminals are located, will be microdissected and assayed for DA using HPLC-EC. Changes in DA concentrations will be correlated with changes in PRL secretion. If there is a negative association between DA levels and prolactin levels with increasing doses of BPA, then it would mean that BPA is capable of increasing PRL levels in the same fashion as estrogen, having negative health implications. Because of our constant exposure to BPA, studying whether BPA is involved with the development of mammary tumors by increasing PRL will help us develop preventive measures or treatment strategies. Supported by NIH AG027697.

NEUROBIOLOGY UNDERLYING MATERNAL AND ANXIETY BASED BEHAVIORS IN LONG-EVANS RATS
Sarah Gail Armstrong
Home Institution(s): Case Western Reserve University
Category: Biological Sciences, Section 1
Location: 2108 EB, 10:00 AM
Mentor(s): Joe Lonstein (Psychology), Christina Ragan (Neuroscience)

This research involves studying the anxiety levels of virgin and post-partum rats, along with determining whether or not there is a correlation between the level of anxiety a specific rat has and the amount of serotonin in their brain, specifically the dorsal raphae. This research is conducted by testing the anxiety of Long-Evans female rats who are virgins or have recently given birth. The elevated plus-maze and the light-dark box are anxiety based experiment models that were used in order to determine the levels of anxiety of the rats. The brains of the rats are also used in order to quantify the levels of tryptophan hydroxylase- 2, a key enzyme in the production of serotonin, in the brains, specifically that of the dorsal raphae, and calculate the correlation between the anxiety of the rats and the levels of serotonin in their brains. What we are doing has the potential to positively affect our society and by association the lives of the people in society because the research that is being conducted can eventually be applied to human beings. If applied to human beings, the lives of many people can be improved by determining which women have the potential of developing an anxiety disorder after giving birth, along with coming up with methods in treating said women.

THE ROLE OF INNERVATION OF THE BONE MARROW ON LYMPHOCYTE DISTRIBUTION AND ACTIVATION
Mohamed Askar
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Location: 2108 EB, 10:15 AM
Mentor(s): Julia Busik (Physiology), Elahé Crockett (Medicine)

Studies from our lab have shown that diabetes induces bone marrow neuropathy (dysfunctional bone-nerve marrow signals). It is also known that diabetes induces a reduction of lymphocytes (a type of immune cells). However, it is not known whether neuropathy can influence lymphocyte distribution. We hypothesize that there will be a change in the lymphocyte populations if we mechanically severe the nerve to the bone marrow of healthy mice. To denervate the bone marrow we surgically cut the sciatic nerve of the mice and compare it with mice that had sham surgery as control. At different time intervals we harvested the spleen, bone marrow, and blood and generated single cell suspensions. We used flow cytometry to detect the effects of denervation on the distribution and activation of lymphocytes (B-cells, T-cells, NK-cells, and NKT-cells). Our results showed a significant reduction in the percentage of lymphocyte populations in the bone marrow for the denervated mice. In the blood we observed a slight increase of some of the lymphocyte populations. Not significant differences were observed in the spleen between the denervated and control mice. We also witnessed an increase in lymphocyte activation in the denervated mouse. Overall mechanical denervation of the bone marrow in healthy mice resulted in a change in lymphocyte distribution and activation. Most importantly, this study suggests a connection between the neuronal and the immune system. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

ROLES OF ANDROGEN RECEPTORS AND INTERLEUKIN 6 IN THE PATHOGENESIS OF HEPATOCELLULAR CARCINOMA
Leena Babiker
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Location: 2219 EB, 9:15 AM
Mentor(s): Hua Xiao (Physiology)

Hepatocellular carcinoma (HCC) is a major health issue worldwide, since it ranks third in annual cancer death and has limited treatment options. Androgen receptors (AR) are highly expressed in human HCC cells; AR is able to promote proliferation of cells and regulate cell apoptosis. HCCs without AR show an increase in cell apoptosis and a decrease in cell proliferation in comparison to HCC cells with AR. Since AR can act as an oncogenic protein, we hypothesize that the level of AR expression in human HCCs correlates with the progression and prognosis of patients with HCC. Interleukin 6 (IL-6) is a multifunctional cytokine that promotes the proliferation of hepatocytes, we also hypothesize that there is a correlation between IL-6 expression and HCC progression and prognosis. To prove this hypothesis, we are going to use the existing DNA microarray datasets in Gene Expression Omnibus (GEO) which shows expression levels of thousands of genes including the AR and IL-6 gene in a set of human HCCs from patients, and we will use statistical methods such as independent T-Tests and Chi-square to show a significant statistical difference in the expression of AR and IL-6 genes in HCCs in comparison to normal liver cells. Also, we are going to compare patient's survival with follow days up in expression levels, as well as compare different expression levels with metastasis and patients' survival. We predict that that the listed comparisons are statistically significant. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

THE EFFECTS OF TIME AND TEMPERATURE ON CLINICAL MICROBIOLOGY SAMPLES IN AN OUTPATIENT SAMPLE DROP BOX

Tiffany Bell
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Location: 2219 EB, 9:30 AM
Mentor(s): John Gerlach (Biomedical Laboratory Diagnostics Program), Barbara Robinson-Dunn (Clinical Pathology, Beaumont Hospital)

Microbiological samples collected at remote clinics are placed in outpatient sample drop boxes and then couriered to core hospital facilities. During this storage, samples are subjected to variations in temperature and the length of amount of time awaiting pick up. The focus of this study is to document the variation between ambient and internal temperatures of a sample drop box and to test the integrity of the culture results of a sample when held at the extreme temperatures encountered in the drop box over several time points. Sputum samples will be the focus of this study and the standard operating procedure for culturing sputum samples employed by Beaumont Hospital will be followed. Sputum samples will be split into 13 aliquots. One will be immediately cultured and used as a reference for the rest of the set. The remaining 12 samples will be placed (one each) at -20C, 0C, 37C and 48C for 2, 4 and 6 hours. At the end of these times they will be cultured and the results compared to the unadulterated sample's results. The amount of growth, diversity of species as well as the comparison of normal flora to possible pathogens will be the focus of review. It is assumed that exposure to extreme temperatures for prolonged time will influence the integrity of the sample.

THE CONTRIBUTION OF PUBERTAL TESTOSTERONE TO SOCIAL PROFICIENCY IN ADULT MALE SYRIAN HAMSTERS

Mickyel Bradford
Home Institution(s): Georgia State University
Category: Biological Sciences, Section 2
Location: 2219 EB, 9:45 AM
Mentor(s): Cheryl Sisk (Neuroscience), Kayla DeLorme (Behavioral Neuroscience Graduate Student)

Social proficiency, the ability to interpret appropriate social cues by context is essential for sexual behavior in hamsters and humans. Pubertal hormones are necessary for adult social proficiency in male Syrian hamsters. Here, we have equated social proficiency with sexual experience in adulthood, as measured by ectopic mounts. In our two groups, the T@P group(the group receiving testosterone at puberty) showed fewer ectopic mounts than the No T@P group (no testosterone at puberty) after repeated tests with a receptive female (male sex experience being equated). Also, we hope to show that a lack of pubertal testosterone results in a decrease in the average number of cells expressing ΔFosB expression in the nucleus accumbens. ΔFosB is a transcription factor implicated in the development of drug addiction and has been shown to increase with sexual experience in both adult male rats and adult female hamsters. However, there is an absence of literature on developmental changes accompanied by ΔFosB. Therefore, in the present study we looked at the relationship between pubertal testosterone and ΔFosB expression, in the nucleus accumbens. Based on our behavioral data on ectopic mounts, we predict an increase in ΔFosB in the T@P group as compared to the No T@P group. These results would suggest that ΔFosB is necessary for social proficiency in adult male Syrian hamsters.

FREE FATTY ACID INDUCERS OF EMT IN HEPG2 CELLS

Andrea Callaway
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Location: 2219 EB, 10:00 AM
Mentor(s): Christina Chan (Biochemistry and Molecular Biology)

What I set out to explore in this project is whether free fatty acids are capable of inducing epithelial to mesenchymal transition or metastasis in HepG2 cells. To determine this, I am treating HepG2 cells with saturated free fatty acid pamitate, unsaturated free fatty acid oleate, and bovine serum albumin (BSA, control). I am then

testing my hypothesis using two methods, one being the in vitro scratch wound healing assay. This procedure was created to track the movement of cells in vitro. The methodology of this procedure is quite simple. A scratch is made through a single layer of cells on a plate. As the cells begin to grow to "heal" the wound (scratch), pictures are taken periodically to track the rate of cell migration across the scratch. Western blots are the second method used, which determine the molecular markers of EMT (epithelial-mesenchymal transition) and metastasis. I expect to obtain results that demonstrate the fact that palmitate and oleate play a role in inducing EMT in HepG2 cells.

CONSERVATION OF CYTOKINES
Quincy Cunningham
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 2
Location: 2219 EB, 10:15 AM
Mentor(s): Vilma Yuzbasiyan-Gurkan (Microbiology and Molecular Genetics)

This experiment was developed to develop cross species primers in cytokines of humans, mice, cats, and dogs. Primers are short fragments of DNA that are complementary to a target region on DNA polymerase. Cytokines are important proteins that specialize in intercellular communication. They are essential to the amplification of DNA through polymerase chain reaction tests (PCR) because of their ability to start DNA synthesis (replication). The UCSC Genome Browser will be used to search for important interleukin proteins (IL1-beta, IL1-alpha, IL-4, etc.) in humans, mice, cats, and dogs. After collecting the genomic code data, a genome alignment system (BioEdit) will help to align the genes to find similar base pair sequences across all four species. From this, Primer BLAST will be used to quantify different aspects of the data such as the melting point, GC content, and bond pairs to develop cross-species primers. The results from Primer BLAST will also tell us if the primer will bind to an unwanted sequence. Primer BLAST helps to simply the process of developing primers and also increases the probability that a successful primer will be used. The newly developed primer will then be used in PCR to determine if it can successfully amplify the selected DNA sample. Future implications of this project will include using stem cells to create cytokines that will halt growth of tumors.

ARGINASE AND VASCULAR FUNCTION
Anthony Ferrantelli
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Location: 2250 EB, 9:15 AM
Mentor(s): Anne Dorrance (Pharmacology and Toxicology), Elahé Crockett (Medicine)

Increased arginase expression is linked to diabetes, but it is not clear if arginase expression is also increased in obesity. Arginase converts arginine to proline; arginine can also be converted into nitric oxide (NO) by nitric oxide synthese. Increased arginase expression could therefore reduce NO production and dilation. We hypothesized that obese rats will have increased arginase expression. This will cause the aorta from the obese rats to dilate when arginase is inhibited. BEC and NOHA were used to inhibit arginase. A wire myograph was used to measure isometric force generated in aortic rings from Sprague Dawley rats fed a high fat (HF) diet or control chow for 17 weeks from 3 weeks of age. We measured the effects of arginase inhibition on acetylcholine (ACH) mediated dilation. The vessels dilated due to the ACH concentrations, however, the arginase inhibition had no effect on the vessels. The vessels dilated at the same increments throughout the experiment. We also investigated if BEC and NOHA were direct dilators, the results were expressed as a percentage of the phenylephrine striation, and are presented as the mean±SEM. NOHA caused an increased dilation in aorta from the HF group compared to control (85.7±9.1 vs. 103.0±5.3, HF vs. control). BEC did not produce dilation in either group (107.0±4.4 vs. 107.5±2.7, HF vs. control). These results suggest that arginase expression may be increased in the aorta from the rats fed the HF diet. Further studies are required to confirm this finding. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

MIGRANT AND SEASONAL FARMWORKERS' NUTRITION AND HEALTH RISKS: BUILDING THE FRAMEWORK FOR CONTINUED RESEARCH
Andie Gonzalez
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 3
Location: 2250 EB, 9:30 AM
Mentor(s): Won Song (Food Science and Human Nutrition), Elahé Crockett (Medicine)

The physical contribution of Migrant and Seasonal Farmworkers (MSFW) to U.S. agriculture is vital. Sustainability of agricultural practices is still dependent on physical labor. MSFW families and children not only sacrifice their time and labor, but also endure the challenges of this occupation. Little attention is paid to the barriers that prevent MSFW families and children to good health. Therefore, our aims are designed to meet one of the goals of Healthy People 2020, to achieve health equity, eliminate disparities, and improve the health of all groups, an opportunity for progress in the MSFW population. Aims of this research will identify and summarize gaps in research and provide a framework for future research and services for this vulnerable and underserved population. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

THE PREVALENCE OF LIFE HISTORY TRADE-OFFS FOR ADAPTIVE GROWTH RATE MUTATIONS IN YEAST
Shyla Hardwick
Home Institution(s): Spelman College
Category: Biological Sciences, Section 3
Location: 2250 EB, 9:45 AM
Mentor(s): Barry Williams (Zoology)

One of the central tenets of biology is that there are antagonistic trade-offs between growth and maintenance. In mulitcellular organisms, this trade-off is most often examined with respect to reproduction and senescence, while in microbes, it is with respect to growth rate and virulence (or other measures of non-growth survival). Yeast are unique in that as unicellular eukaryotes that have long served as a model system in both studies of both chronological and replicative aging as well as microbial evolution. Here we sought to determine whether trade-offs in growth and senescence are present in microbes. We will generate a collection of adaptive spontaneous mutations evolved under strong selective pressures (high drug concentrations and high osmotic stress). After validation that each adaptive mutation is heritable and segregates in a simple Mendelian fashion, we can tell whether negative correlations exist between growth rate, chronological aging, replicative aging, mating, and sporulation efficiency. The discovery of life history trade-offs in yeast by means of experimental evolution holds the promise of being able to identify insight on the molecular, inner workings of mutational tradeoffs and a better understanding of the relationship between reproduction and lifespan. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

PANNEXIN1 IN VASCULAR SMOOTH MUSCLE CONSTRICTION FROM MESENTERIC ARTIERES
Jessica Hernandez
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 3
Location: 2250 EB, 10:00 AM
Mentor(s): James Galligan (Pharmacology and Toxicology), Hui Xu (Pharmacology and Toxicology), Elahé Crockett (Medicine)

Introduction: Norepinephrine and adenosine triphosphate (ATP) are known to constrict blood vessels which, causes smooth muscle constriction and affects blood pressure regulation. However, the exact mechanisms of constriction are unclear. Billaud et al., showed that activation of the α1 adrenergic receptor on smooth muscle cells causes the Pannexin1 channel to open. This process releases ATP that binds to P2Y receptors causing constriction. Objective: In this study we investigated the role of Pannexin1 in constriction in mesenteric arteries and veins of normotensive and hypertensive rats, in vitro. Methods: Pressurized myograph coupled with video microscopy was used to monitor blood vessel constriction. Phenylephrine was used to activate the α1 receptor to

reach maximum constriction, while Mefloquine hydrochloride was used to block the Pannexin1 channel. Results: Phenylephrine constricted the normotensive arteries with an average maximum value of 86.96% (n=6) and 83.33% (n=6) for hypertensive arteries. In the presence of 1µM Mefloquine hydrochloride the average maximal contraction induced by phenylephrine was 76.35% (n=3) normotensive arteries and 78.90% (n=3) in hypertensive arteries. In the presence of 2µM Mefloquine hydrochloride average maximal contraction induced by phenylephrine was on average 48.69% (n=3) normotensive arteries and 68.15% (n=3) in hypertensive arteries. Conclusions: ATP released by Pannexin1 channels are involved in the constriction of arteries. Future studies will looks at veins for comparison. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

THE EFFECT OF AN MLK INHIBITOR ON METASTATIC MOUSE MAMMARY CANCER CELLS

Lishann Ingram
Home Institution(s): Clark Atlanta University
Category: Biological Sciences, Section 3
Location: 2250 EB, 10:15 AM
Mentor(s): Kathleen Gallo (Physiology)

In the United States, one of eight women will be diagnosed with breast cancer during their lifespan. Survival rates of breast cancer patients decrease dramatically when distant metastasis occurs. “Metastasis is a cancer that has spread from the place where it first started to another place in the body. (Cancer.gov.2011-12-18).” Cancer cell migration is fundamentally required for breast cancer invasion and metastasis. Several signaling pathways have been reported to facilitate the migration and invasion of cancer cells. Inhibition of some of the signaling molecules such as β1 integrin, PKC and PI3K signaling, Receptor tyrosine kinases (RTKs) and hypoxia-inducible factor-1 (HIF-1)-mediated pathways has shown a potential to be a therapeutic approach to inhibit breast cancer metastasis. Our lab is interested in evaluating a therapeutic potential of mitogen activating protein kinase (MAPK) pathway inhibitor in breast cancer metastasis. In my study, the effect of MAPK pathway inhibitor on MAPK signaling and migratory activity of cancer will be investigated in a highly metastatic mouse mammary cancer cell line, 4T1. In this study, 4T1 have been engineered to express the firefly luciferase gene (4T1-luc2) a purpose of in vivo imaging. The effect of the inhibitor on cancer cell migration will be determined using a wound healing assay. The activity and expression of protein in MAPK Signaling pathway will be analyzed through Western Blotting.

THE EFFECTS OF MUSHROOM EXTRACTS ON TNF INDUCED OSTEOBLAST CELL DEATH

Mustaf Jeylani
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Location: 3405A EB, 9:15 AM
Mentor(s): Laura McCabe (Physiology and Radiology), Elahé Crockett (Medicine)

Osteoporosis, very low bone density, affects over 10 million Americans and puts them at risk for fractures. A contributor to this outcome is a reduction in the number of osteoblasts, the cells responsible for producing bone. Increased osteoblast death has been identified in disease such as type 1 diabetes (T1D) and is associated with increased TNF levels. My research is focused on examining osteoblast death in vivo and in vitro. In long term T1D mice, where bone TNF is decreased, I found that osteoblast death was actually decreased. In vitro, I found that TNF increases osteoblast death, consistent with in vivo, and I am using this system to test factors that will reduce osteoblast death. Specifically, I am testing 8 different mushroom extracts and assessing their effect on TNF induced osteoblast cell death. I am looking at mushrooms because they are currently being considered as a possible treatment for diseases. I am using the caspase-glo 3/7 assay to detect caspase activity involved in apoptosis. I am looking at 4 different conditions: cells alone, cells with mushroom extracts, cells with TNFα and cells with mushroom extracts and TNFα. To further continue this experiment, we are hoping to see how these extracted mushrooms will reduce the osteoblast death and prevent osteoporosis. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

REGULATION OF INFLAMMATION BY THIOREDOXIN INTERACTING PROTEIN (TXNIP) UNDER HYPERGLYCEMIC CONDITIONS IN MÜLLER CELLS

Miguel Joaquin
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Location: 3405A EB, 9:30 AM
Mentor(s): Susanne Mohr (Physiology), Elahé Crockett (Medicine)

Introduction: Thioredoxin Interacting Protein (TXNIP) was originally considered to be a glucose response element involved in insulin regulation. However, recently TXNIP has been suggested to play a role in inflammation. More specifically, activation of TXNIP has been linked with the activation of the pro-inflammatory enzyme caspase-1. Whether this occurs under hyperglycemic conditions in Müller cells was the focus of this study. Methods: The retinal Müller cell line (rMC-1) was treated in normal glucose (5mM) and high glucose (25mM) for 24 hours. TXNIP protein expression was measured using Western Blot Analysis. Quantification of bands was done using Infrared imaging and utilization of Odyssey Software. Following a siRNA-mediated knockdown of TXNIP in rMC-1 cells treated with normal and high glucose, caspase-1 activity was measured using the caspase-1 specific fluorescent substrate YVAD-AFC. Empty vector and scrambled siRNA served as control. Results/Discussion: TXNIP expression was significantly increased in high glucose treated rMC-1 cells compared to control. SiRNA treatment prevented high glucose-induced up regulation of TXNIP. Caspase-1 activity seems to be slightly affected by siRNA treatment as well. Conclusions: Müller cells play a prominent role in the maintenance of the retina. During diabetic retinopathy these cells become activated leading to cellular injury and sustained tissue damage. Our data suggests that TXNIP expression is critical for Müller cell activation and inflammation. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

PRENATAL STRESS AFFECTS LIPOPROTEIN LIPASE EXPRESSION IN ADIPOSE TISSUE OF DIET-INDUCED OBESE AND DIETARY RESISTANT MALE RATS

Derrick Jones, Jr.
Home Institution(s): Virginia Union University
Category: Biological Sciences, Section 4
Location: 3405A EB, 9:45 AM
Mentor(s): Sheba MohanKumar (Pharmacology and Toxicology), Priya Balasubramanian (Pharmacology and Toxicology)

Prenatal stress has been shown to promote adiposity in the offspring. The mechanism by which this occurs is not clear. In this study, we investigated the possibility that prenatal stress could increase the expression of lipoprotein lipase (LPL), an enzyme that is critical for storing fat in adipose tissue in the offspring, thereby promoting obesity. Female diet-induced obese (DIO) and dietary resistant (DR) rats were subjected to a chronic stress paradigm from day 14 to 21 of pregnancy. The male offspring were placed on a chow diet after weaning. Body weight and food intake were measured at regular intervals. When the pups were 9 weeks old, they were placed on either a chow or high fat diet for 1 week and sacrificed. Trunk blood was collected and serum corticosterone, insulin and leptin were measured by radioimmunoassay. Adipose tissue weight was measured. Total RNA was extracted from adipose tissue and converted to cDNA. Primers for LPL and two of its regulators, apo CII and apo CIII were used to perform RT-PCR. Feeding a high fat diet for 1 week produced an increase in body weight, food intake, adipose tissue weight, corticosterone and leptin. Two-way ANOVA indicates that prenatal stress exposure did not affect any of these parameters. An effect of prenatal stress was apparent in insulin levels in both DIO and DR rats. The impact of prenatal stress on LPL expression is currently being investigated.

ROLE OF SPHINGOSINE-1-PHOSPHATE RECEPTOR 2 IN UPREGULATION OF CYTOKINES BY BILE ACIDS
Hahyung Kim
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Location: 3405A EB, 10:00 AM
Mentor(s): Bryan Copple (Pharmacology and Toxicology), Elahé Crockett (Medicine)

The condition cholestasis is caused by disrupted excretion of bile acids from the liver. Cholestasis can lead to increased concentrations of bile acids in the blood and liver, causing hepatocellular injury. If neglected, this condition leads to liver fibrosis. Currently it is known that when hepatocytes are treated with the bile acid, taurocholic acid (TCA), mRNA levels of interleukin-23 (IL-23), IL-1β, and macrophage inflammatory protein-2 (MIP-2) are increased. IL-23 and IL-1β regulate Th17 cell differentiation, which produces the inflammatory cytokine, IL-17A. IL-17A is responsible for inflammation during cholestasis. MIP-2 is responsible for recruitment of neutrophils during cholestasis. What remains unknown, however, is the mechanism by which TCA increases IL-23, IL-1β, and MIP-2. Recent studies have demonstrated that the G-protein coupled receptor, Sphingosine-1-Phosphate receptor 2 (S1PR2) is activated by TCA in hepatocytes. Accordingly, we hypothesized that S1PR2 is involved in the mechanism of upregulation of IL-23, IL-1β, and MIP-2 by TCA. Murine hepatocytes were isolated and treated with TCA and the S1PR2 antagonist, JTE-013. After treatment, hepatocyte RNA was isolated and real-time PCR was performed to quantify mRNA levels of IL-23, IL-1β, and MIP-2. Interestingly, JTE-013 prevented upregulation of MIP-2, however levels of IL-23 and IL-1β were unaffected. These data demonstrate that upregulation of MIP-2 requires S1PR2, whereas upregulation of IL-23 and IL-1β occurs by a different mechanism. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

INTERACTION OF CHOLINERGIC AND TOLL-LIKE RECEPTOR PATHWAYS IN ISOLATED MACROPHAGES
Vernon LaLone
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Location: 3405A EB, 10:15 AM
Mentor(s): Nara Parameswaran (Physiology)

Acetylcholine is a key molecule that mediates cholinergic-immune interaction in the body. Acetylcholine has been shown to attenuate endotoxin-induced TNF-α production in murine macrophage via the nicotinic acetylcholine receptor; this regulatory relationship between the nervous system and the immune system is termed the cholinergic anti-inflammatory pathway and offers novel therapeutic targets for different inflammatory diseases including atherosclerosis, endotoxemia and sepsis. Pyridostigmine bromide (PB) is an acetylcholinesterase antagonist; it prolongs the effects of the common neurological signaling molecule: acetylcholine. PB has been used in the protection of soldiers from the chemical neurotoxin soman and as potential treatment for Alzheimer's dementia. In this study, we hope to shed light on the regulatory mechanism by which PB acts on isolated macrophages in the presence of lipopolysaccharide (a toll-like receptor 4 ligand). We hypothesize that inhibition acetylcholinesterase by PB increases the levels of acetylcholine in isolated macrophages (without any neural input) that then blocks LPS-induced TNFα and IL-6 production (two major cytokines). Our preliminary results demonstrate that pretreatment with PB inhibits LPS-induced TNF-α and IL-6 production. To test whether this inhibition is due to acetylcholine production from isolated macrophages, we will use selective and non-selective acetylcholine receptor antagonists to reverse the inhibition as well as measure acetylcholine levels in the media. Collectively, our study will help to better understand the molecular mechanisms of the cholinergic anti-inflammatory pathway in isolated macrophages and may assist in the discovery of therapeutic targets for inflammatory disease treatment.

NEUROENDOCRINE CHANGES IN ACUTE DIABETES

Alba Leone
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Location: 3405B EB, 9:15 AM
Mentor(s): Sheba MohanKumar (Pharmacology and Toxicology), Elahé Crockett (Medicine)

Diabetes is a metabolic disorder that leads to complications such as hypertension, myocardial infarction, peripheral neuropathy, memory loss, etc. Most of these conditions are induced as a result of neuroendocrine changes produced by diabetes, such as activation of the stress axis. The stress axis or hypothalamic-pituitary-adrenal axis (HPA axis) is a complex set of direct and feedback interactions between the hypothalamus, pituitary gland and the adrenal glands that regulate stress responses and several body functions. The resulting increase in circulating corticosterone levels can contribute to neuronal degeneration in the brain, especially in the hippocampus leading to memory loss. Besides increasing glucocorticoid levels, diabetes also results in a reduction in leptin levels that can cause a further activation of the stress axis. We have observed these changes in animals with long term diabetes (14 days). However, it is not clear when these changes become evident in diabetic animals. To study this, we treated adult male Sprague Dawley rats with Streptozotocin (65mg/kg BW) or the vehicle and sacrificed them 3 days later. Body weight, blood glucose levels, serum corticosterone and leptin levels were measured. Their brains were removed, frozen and sectioned. The paraventricular nucleus (PVN) that controls the stress axis was microdissected and analyzed for catecholamine concentrations using HPLC-EC. We expect to see an elevation in norepinephrine levels in the PVN and a corresponding increase in serum corticosterone, but only a modest reduction in leptin levels. This will help us understand what hormonal changes contribute to neuroendocrine functions in actue diabetes. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

FEMALE RESPONCE TO DISHONEST MALE SIGNALS IN THREE-SPINED STICKLEBACK FISH

Chelsea Lewis
Home Institution(s): Trinity University
Category: Biological Sciences, Section 5
Location: 3405B EB, 9:30 AM
Mentor(s): Janette Boughman (Zoology)

As organisms reach the end of their reproductive lifespan, they often invest more in reproduction than they do early in life. In the three-spined stickleback (Gasterosteus aculeatus), males build nests and provide parental care, while females choose the males they will mate with. To attract gravid females, males develop nuptial coloration and perform courtship displays. Previous research shows that during the middle of the breeding season, all males will exhibit high levels of coloration, while in the early and late parts of the breeding season, males will differentiate based on both genetic and environmental effects. Since females use these colorations as cues of male quality, we are interested in tracking how female choosiness varies across the season in concert with change in male phenotypes. We scored nuptial coloration (visual signals like the red throat, body color, eye color) of all males and assessed both female search behavior and mating decisions in large kiddie pools throughout the breeding season. We expect to see a bell curve pattern of intensity male phenotypes, which would be evidence that the signal is dishonest about male quality during the middle of the breeding season. We expect that females still pay attention to the nuptial coloration, but could be paying attention to other signals of quality, such as body size or courtship displays. If females do pay attention to this possibly dishonest signal, it could explain the persistent variety of male phenotypes seen in current stickleback populations.

HOW IS TETRODOTOXIN DETECTED IN THE OLFACTORY EPITHELIUM OF ROUGH-SKINNED NEWTS (TARICHA GRANULOSA)?

Aaron Neal
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 5
Location: 3405B EB, 9:45 AM
Mentor(s): Heather Eisthen (Zoology), Tiuana Davis (Zoology)

Rough-skinned newts (Taricha granulosa) are amphibians that live in both terrestrial and aquatic habitats in coniferous-forested areas along the West Coast. They produce a potent neurotoxin, tetrodotoxin (TTX), which in most organisms blocks voltage-gated sodium channels, inhibiting neuronal firing. In newts TTX does not block neuronal firing. Previous data from our lab demonstrate that TTX activates olfactory receptor neurons. In the wild, newts aggregate in large numbers, and perhaps use TTX to detect the presence of other newts. We are using electroolfactogram (EOG) recordings to measure olfactory responses to TTX in adult male newts. As a control, we are also examining responses to a food odorant, a mixture of amino acids. Data previously collected suggest that TTX does not bind to a typical odorant receptor, and may instead directly bind to and activate a sodium channel. To test this model, we substituted barium for calcium in the extracellular space. We found that responses to both TTX and amino acids are abolished in the presence of barium. These results indicate that the signal transduction pathway for TTX is more complex than previously thought, involving both calcium and sodium channels. This suggests that evolution of ion channels and multistep signal transduction pathways can occur surprisingly rapidly. The results of this study are helping us understand the ways in which evolution at the molecular level contributes to behavioral evolution. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

SELENOPROTEIN ACTIVITY ALTERS PRO-INFLAMMATORY EICOSANOID BIOSYNTHESIS IN MURINE MACROPHAGES

Chelsea Niewiadomski
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Location: 3405B EB, 10:00 AM
Mentor(s): Lorraine Sordillo (Large Animal Clinical Sciences)

An underlying cause of multiple diseases today is uncontrolled inflammation. Macrophages play a significant role in regulating inflammation through the biosynthesis of eicosanoids. In the mammalian diet, Selenium (Se) is an essential nutrient critical for the optimal immune function. Selenium specifically exhibits a major role within innate immunity and inflammation. A diet containing ample Selenium, shown to alter the expression of specific eicosanoids, is considered to have positive health effects through the activity of selenoproteins; although the exact protective mechanisms of Se are unknown. The hypothesis of this study was that decreased selenoprotein activity enhances COX and LOX derived eicosanoid biosynthesis and contributes to a pro-inflammatory phenotype in macrophages. It was shown that reduced selenoprotein activity resulted in the accumulation of reactive oxygen species, enhanced COX and LOX expression, and increased pro-and anti-inflammatory eicosanoids for instance 15-HETE and resolvin D1 respectively. Changes which occurred within eicosanoid biosynthesis were associated with an exacerbated pro-inflammatory phenotype. Collectively, the results demonstrate that Se's effect on eicosanoid biosynthesis is carried out, in part, through the activity of selenoproteins. A better comprehension of the Se-dependent control mechanisms governing eicosanoid biosynthesis may reveal nutritional therapies which could counteract the harmful effects of uncontrolled inflammation due to eicosanoids.

EFFECTS OF WEALTH ON FETAL GROWTH AND PRETERM BIRTH IN WOMEN IN MID-MICHIGAN
Ijeoma Nnanabu
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Location: 3405B EB, 10:15 AM
Mentor(s): Nigel Paneth (Epidemiology, Pediatrics and Human Development), Jean Kerver (Epidemiology), Elahé Crockett (Medicine)

BACKGROUND: More than half a million babies are born premature in the United States. In 2009 the preterm birth rate in Michigan was 12.4% and 8.4% of babies born in Michigan were low birth weight. Many studies have been done on measures of socioeconomic status such as maternal education and income and perinatal outcomes, but there is not much research on how wealth (as measured by house, car and stock/bond ownership) affects perinatal outcomes. OBJECTIVE: The purpose of this study is to determine if wealth is associated with the risk of preterm birth (PTB) and fetal growth, once education and income have been taken into account. PTB was defined as <37 weeks, full term defined as 37-42 weeks. METHODS: The data source was the Archive for Research on Child Health (ARCH) (N=410) which collects interview information about SES from mothers early in the first trimester in three clinics and links them to birth certificate data containing birth weight and gestational age. By comparing each baby's birth weight to the median birth weight for his or her week of gestation based on a national standard of birth weight, I was able to assign each baby a fetal growth ratio. RESULTS: Data will be shown on the relationship of wealth and other SES measures to preterm birth and fetal growth ratio. I hypothesize that wealth will add additional predictive information to other SES factors in its relation to preterm birth and fetal growth. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

DIFFERENTIAL INFLAMMATORY RESPONSE BETWEEN SPLENIC AND COLONIC IMMUNE CELLS
Kimberly Obey
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Location: 2108 EB, 10:45 AM
Mentor(s): Narayanan Parameswaran (Physiology), Taehyung Lee (Physiology), Elahé Crockett (Medicine)

Inflammation is a fundamental response of the body that can have both beneficial and deleterious effects on the host. There are many factors that contribute to the process of the inflammatory response. Among them, cytokines-protein molecules that are secreted from various cell types-play an important role. Expression of these cytokines is regulated by intracellular cell signaling pathways. In my research, I am currently testing the hypothesis that these signaling pathways in immune cells from different organs is differentially regulated and therefore, I expect that the production of cytokines in response to ligand stimulation will be different between immune cells from different organs. To test this hypothesis, I will examine the differences of cytokine production levels of the splenocytes and the cells from the colon (two major immune organs). I will stimulate these cells with three different stimulants in vitro. For this, I will use Pam3CSK4, polyI:C, and lipopolysaccharide (all three of which are microbial products). These different stimulants will each induce different receptor signaling pathways. Using these stimulants I will observe the production of the cytokines from the cells in the spleen and the colon using a technique called "Flow Cytometry" to identify tissue-specific and cell-type specific effects of the microbial products. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

STABLE EXPRESSION OF TOMOREGULIN IN CHINESE HAMSTER OVARY EXPRESSION SYSTEM
Mandi Pena
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Location: 2108 EB, 11:00 AM
Mentor(s): Erik Martinez-Hackert (Biochemistry), Dorothy Tappenden (Biochemistry)

Tomoregulin is a transmembrane protein that inhibits cell proliferation through transforming growth factor beta (TGFβ) signaling. Our research focuses on establishing if human Tomoregulin can inhibit tumor progression

through its repressive effects on TGFβ family members. Two isoforms, Tomoregulin-1 and Tomregulin-2 (TMEFF-1& 2), are believed to disrupt the interactions between epidermal growth factor Cripto-FRL1-Cryptic (EGF-CFC) proteins. These proteins, also TGFβ members, are essential for the Nodal signaling pathway. EGF-CFC proteins are normally involved in managing cell development. In addition to the developmental role of TGFβ proteins, they also cause cancer progression through uncontrolled cellular proliferation. Understanding the deregulation of this pathway can lead to a better understanding of cancer biology. The interaction of Tomoregulin's effect on EGF-CFC proteins will be studied using x-ray crystallography after stable cell lines over expressing TMEFF-1 & 2 are created. We believe our research could lead to the development of using Tomoregulin for drug therapy in individuals with cancer. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

THE EFFECT OF CLONAL DIVERSITY ON RATES OF ADAPTATION
Shonkela Pittman
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 6
Location: 2108 EB, 11:15 AM
Mentor(s): Barry Williams (Zoology)

The genetic basis of adaptation for asexual organisms is complex because mutations altering the fitness of one clone will 'compete' against mutations from other clones, because recombination does not combine mutations together within one genome, and is termed clonal interference. Moreover, clonal interference among clones that harbor otherwise homogeneous genomes, may be further complicated by competition among unrelated clones, which occurs during infections with heterogeneous populations of pathogens. However, little is known about the potential interactions between clonal interference and competition. The focus of this experiment is to determine if increasing competition among a diversity of asexual microbes alters rates of adaptation. Here we developed natural haploid strains of Saccharomyces cerevisiae that were isolated from three ecological conditions, and are thus unrelated. We evolved various combinations of related versus unrelated strains asexually in two novel environmental conditions. Fluorescent markers were used to visualize the relative abundance of each strain within the evolving populations in order to determine the degree of clonal interference. Growth rates in the evolved populations, relative to the starting ancestor, were determined in order to compare rates of adaptation among treatments. Prospective differences in rates of adaptation will help elucidate the dynamics of host adaptation in cases of multiple-strain infections. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

THERMODYNAMIC MODELING OF RHOMBOID EXPRESSION IN DROSOPHILA MELANOGASTER
Irina Pushel
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Location: 2108 EB, 11:30 AM
Mentor(s): David Arnosti (Biochemistry and Molecular Biology)

Regulation of gene expression within a cell takes place via numerous mechanisms from transcription through translation. Our interests lie in developing a model to explain how transcription factor (TF) binding to DNA at known binding sites can affect the strength of gene expression. In determining these effects, we increase our understanding of gene expression beyond DNA sequences, giving us tools to analyze such complex processes in other systems, including applications in medicine. To better understand the effects of enhancer architecture on gene regulation, we examined expression of rhomboid, a dorsal-ventral patterning gene expressed during development in early blastoderm embryos. Combining quantitative gene expression data from Drosophila embryos with known DNA-level information about the rhomboid enhancer, we developed a fractional occupancy model, depicting rhomboid expression as a function of three TFs: Dorsal, Twist, and Snail. This model takes a novel approach, considering interactions between TFs in addition to single-TF contributions to rhomboid expression. Using expression data from single and multiple binding site mutations in addition to the wild type enhancer, we were able to gain more insight into the role of each TF in the system. We did this by testing various hypotheses for

the cooperative and quenching interactions between TFs, reflecting different biological hypotheses. This allowed us to establish patterns in TF interactions and gave us further insight into how gene expression may be regulated during transcription.

HYPEROXIA IN NEWBORN MICE INHIBITS HIF1α PREVENTING NORMAL LUNG DEVELOPMENT
Eva Marie Quijano-Cardé
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Location: 2108 EB, 11:45 AM
Mentor(s): John LaPres (Biochemistry)

More than 500,000 infants are born prematurely in the United States every year, requiring supplemental oxygen to survive. They are susceptible to inflammatory diseases, such as asthma. A link between premature birth and asthma has not been established. One of the key transcription factors linked to normal lung development is the Hypoxia-inducible factor 1α (HIF1α), which regulates the cell's response to decreased concentrations of oxygen (hypoxia). Loss of HIF1α early in post-natal development was recently demonstrated to impact the innate immunity of the lung, with effects similar to prematurity and supplemental oxygen. Therefore, we suspected that exposure to high concentrations of supplemental oxygen inhibits HIF1α during the first months of life and this loss of normal hypoxic signaling is in part responsible for the susceptibility to inflammatory diseases. Our hypothesis was tested using two models. Transgenic mice were exposed to 21% or 70% oxygen, both in presence or absence of Dimethyloxaloylglycine and Doxycycline. Lung tissue was assayed for expression of HIF1α target genes. In this manner, the impact of supplemental oxygen on HIF1α-mediated transcription was determined. In the second phase, in vitro cell cultures of lung epithelial cells, alone or co-cultured with macrophage cells were examined for their response to hypoxia, in the presence or absence of cobalt. This will allow us to identify epithelial-derived signals that might explain the change in immunity in vivo. It is expected that this research will help understand the link between prematurity, hyperoxia and changes in innate immunity, offering therapeutic targets for reversing this link.

INDUCTION OF INTESTINAL EPITHELIAL DIFFERENTIATION AND AN EXPRESSION OF DIFFERENTIATION MARKERS BY THE INFLUENCE OF SCHLAFEN 3
Mandy Shelby
Home Institution(s): Tuskegee University
Category: Biological Sciences, Section 7
Location: 2219 EB, 10:45 AM
Mentor(s): Marc Basson (Surgery)

Diseases or disorders associated with the small intestines are varied amongst people because of surgical procedures or even the event of fasting. Cells that are developed at the base of crypts and matured onto villi are substantially the conductors of nutrients being absorbed into the body. Nutrients disregarded from the body are probable cases of intestinal dysfunction resulting from the lack of regular intake of proper nutrients. Schlafen 3 is a protein studied on promoting enterocytic differentiation. In this study, Schlafen 3 is expressed by intraluminal injection of Schlafen 3 Adenovirus vector to evaluate areas of intestines where Schlafen 3 occurs. The induction of enterocytic differentiation by Schlafen 3 is conducted in vivo and in vitro. Rises of DPPIV and GLUT2, and increased length of villi are measured as markers of differentiation to associate the over expression of Schlafen 3. Increase of these enzymes can help identify key targets and determine the function of Schlafen 3. Markers of differentiation and Schlafen 3 expression will be analyzed using qRT-PCR and gel electrophoresis. We hypothesize that Schlafen 3 will promote enterocytic differentiation localized throughout the intestinal epithelial cells. Schlafen 3 is being studied as an active protein in intestinal epithelial of rats. Understanding the function of Schlafen 3 may help identify causative reactions for manipulation of the mucosal function. This can help improve the intake of nutrients, prospering enteral function. Increase in survival rate can also be managed by the alleviation of diseases and disorders such as mucosal atrophy and short gut syndrome.

THE ROLE OF HIF-1ALPHA IN COMMUNICATION BETWEEN THE DENDRITIC CELLS AND EPITHELIUM OF THE LUNG
Omar Taher
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 7
Location: 2219 EB, 11:00 AM
Mentor(s): John Lapres (Biochemistry), Elahé Crockett (Medicine)

Asthma, an inflammatory lung disease, strikes approximately 25 million Americans. The cause for this growing population of asthmatics remains largely unknown. Irregular development of the immune system and the lungs following premature birth and exposure to supplemental oxygen is a factor. Hypoxia also plays a role in lung development and inflammation. Our laboratory demonstrated that hypoxia-inducible factor 1alpha (HIF1α), the main transcriptional regulator of the hypoxic response, was critical for normal lung development. Pups lacking HIF1α in lung epithelia die shortly after parturition from respiratory distress syndrome. We used these transgenic mice to demonstrate that HIF1α played a central role in programming the immunity of the lung. When HIF1α was removed shortly after birth, the mice were biased towards an asthma-like Th2-mediated inflammation. In contrast, if HIF1α was deleted after post-natal development of the lung was complete, these mice displayed the same type of inflammation as control animals. Our hypothesis is that exposure to high levels of oxygen (hyperoxia) could lead to inhibition of HIF1α during the developmental period of the lungs, which could compromise normal cellular communication between antigen presenting cells (APCs) and the epithelia, leading to asthma susceptibility. To test our hypothesis, we divided the experiment into two stages. First, we will culture lung epithelial cells alone or in a co-culture of dendritic cells, the major APC in the lung. These studies will be performed in the presence or absence of cobalt, a hypoxic mimic and lung toxicant. The second stage involves the exposure of our mice to hyperoxia and in the presence and absence of the HIF1α inducer, dimethyloxaloylglycine (DMOG). The tissues will then be analyzed for the expression of HIF1α target genes. The completion of these two stages will identify the signals involved in the communication between epithelial-specific HIF1α signaling and APCs that program the immunity of the lung and determine if these signals are active in the lung following hyperoxia exposure. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

SELF-EFFICACY FOR MANAGEMENT OF CORONARY HEART DISEASE PREVENTION AMONG MINORITY AND LOW-INCOME POPULATIONS IN MICHIGAN
Alexis Therman
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 7
Location: 2219 EB, 11:15 AM
Mentor(s): Ade Olomu (Medicine), Elahé Crockett (Medicine)

Background: The perception of how a person is able to manage their health affects their health outcomes. We hypothesize that minority and low-income patients with Coronary Heart Disease (CHD)/Diabetes that feel competent in managing their health condition will score better in the Self-Efficacy for Managing Chronic Disease Scale and have better control of their diabetes and hypertension. Objective: 1) To determine the self efficacy of minority and low income populations with CHD/Diabetes in managing their chronic disease in Federally Qualified Healthcare Centers (FQHC) in Michigan. 2) To determine the role of self-efficacy in the control of Diabetes and hypertension in minority patients with CHD/DM in FQHC. Method: This study is part of a larger project known as Guidelines Applied in Practice (GAP) program. The GAP program is designed to improve secondary prevention of heart disease for minority and low-income populations with CHD/DM. Patients learned about the role of evidence-based medications and life-style changes in prevention of heart disease during the group visit. One hundred and sixty patients completed the Self –Efficacy for Managing Chronic Disease 6-Item survey during the group visits. Results are pending. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

ANALYSIS OF GENE EXPRESSION INTENSITY FOR USE IN A DIFFERENTIAL EQUATIONS SOLVER
Marc Thompson
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 7
Location: 2219 EB, 11:30 AM
Mentor(s): Chichia Chiu (Mathematics)

An organism's genome acts as its fundamental source of cellular regulatory functions. The travel of information from the genome to proteins generated through transcription controls nearly all cellular functions. With the ability to predict how genes are most efficiently activated and deactivated we will have a better understanding of life processes which will impact areas of biology ranging from a person's hair color to their susceptibility to disease. In order to develop an efficient predictor of gene expression we have generated a model of gene regulatory systems using Drosophila embryos which was compared to a preexisting data set of expression output. The embryos' intensity of gene expression was measured based on their nuclei and the time at which the measure of intensity was taken. Once the data was collected, we analyzed the model output data with the intention of creating a differential equations solver that will effectively simulate gene expression. This study shows how the model of gene regulatory systems was analyzed and interpreted in order to identify correlations as well as significant factors in gene expression. By first ordering the data sets of intensity based on two characteristics, nuclei and time, we compared the data to the preexisting experimental data set and generated a table of Root Mean Square Errors (RMSE) and Correlation Coefficients (CC) in order to recognize patterns in the data. Then, by implementing a number of statistical tests including Weighted RMSE, Chi Squared, and Kolmogorov-Smirnov (KS) tests, a table was generated to show the significance of factors in gene expression. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

COMPARING THE FUNCTIONAL PROPERTIES OF VARIOUS PROTEINS
Quinton Ford
Home Institution(s): Alabama Agricultural and Mechanical University
Category: Biological Sciences, Section 7
Location: 2219 EB, 11:45 AM
Mentor(s): Zeynep Ustunol (Food Science and Human Nutrition), Mara Laurain (Food Science)

This experiment was performed to see if there is an effective alternative to soy protein extraction other than using hexane. Hexane is a colorless liquid that is also an irritant that can cause dizziness, nausea and headaches. The problem with using hexane is it is a very volatile liquid and there is a concern with residual residue and the release of it into the atmosphere during processing. This study is important because we are trying to find a safer alternative way of extracting soy protein. Others studies that have been conducted have shown that there are alternatives that are comparable to the hexane. The three functional properties that will be tested are emulsification property, solubility and water-holding capacity and they will be compared to the hexane. We will run tests to see how well the proteins dissolve in water, how well it holds water and how effective it is at combining two immiscible liquids together. In my data, I expect to see results that are similar to hexane. This would prove that companies could use other methods to extract protein and still have an effective product.

THE EFFECT OF PROBIOTICS ON OSTEOPOROSIS IN POST-MENOPAUSAL MICE
Ellis Tibbs
Home Institution(s): University of Missouri, Columbia
Category: Biological Sciences, Section 8
Location: 2250 EB, 10:45 AM
Mentor(s): Laura McCabe (Immunology)

Postmenopausal osteoporosis is a very common form of bone loss and the underlying mechanisms are multifaceted. Recently, evidence suggests that T cells play a pivotal role in the postmenopausal bone loss. Using ovariectomized mice, we found that estrogen deficiency disturbs the gut immune system by upregulating cytokines such as IL-17A and IL-22 secreted by Th17 cells in ileum where the Peyer's patches or aggregated

lymphoid nodules locate at 2 weeks and 4 weeks after the ovariectomy. This proinflammatory response changed the gut morphology which will affect the nutrients absorption and bone quality. Using histology, we found that villi length, cryt depth, goblet cells were changed. In addition, IL-17A and IL-22 have been known to stimulate the activation of osteoclasts, which functions in bone resorption. Bone density is determined by the balance between osteoblast and osteoclast. Therefore the number of bone cells: osteoblasts and osteoclasts are counted from the TRAP stain slides.

INVOLVEMENT IN TREATMENT DECISION MAKING OF LOCAL IMMIGRANT POPULATIONS
Nallely Trejo
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 8
Location: 2250 EB, 11:00 AM
Mentor(s): Adesuwa Olomu (Medicine), Elahé Crockett (Medicine)

Background: Patients' involvement in their treatment decision has been shown to improve their health outcomes. Studies of the extent to which immigrant populations that attend Federally Qualified Healthcare Centers (FQHCs) participate in their treatment decision-making and how this affects their health outcomes is still lacking. FQHCs provide outpatient services to large number of patients in United States, including racially and ethnically diverse populations that are often comprised of minority and low income populations. Objectives: 1) To determine; a) confidence in treatment decision-making; b) satisfaction with communication (SWC) among immigrant populations compared to other populations in FQHCs in Michigan. 2) To determine the impact of confidence in decision-making/SCW on control of hypertension and Diabetes Mellitus (DM) in these populations. Methods: This study is part of the Guidelines Applied in Practice (GAP) project designed to improve secondary prevention of heart disease for minority and low income populations at the FQHCs in Michigan. One hundred and sixty patients with history of hypertension, coronary artery disease (CAD) and DM were enrolled into the study at two healthcare centers from Jan 2011- June 2012. Patients completed the 20-item patient based Combined Outcome Measure for Risk Communication and Treatment Decision-making Effectiveness (COMRADE) survey during a group visit. The COMRADE survey was used to evaluate confidence in treatment decision-making and satisfaction with communication. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

THE ROLE OF COMPENSATORY ADAPTATIONS IN SPECIATION
Antoineen White
Home Institution(s): Amherst College
Category: Biological Sciences, Section 8
Location: 2250 EB, 11:15 AM
Mentor(s): Barry Williams (Zoology)

Speciation occurs when two or more populations develop reproductive incompatibility. Prominent in this discussion of speciation is the role of adaptation in speeding up genetic diversification, therefore, indirectly speciation. If deleterious mutations are common and become fixed in small populations, natural selection may act to compensate for the original mutation and indirectly restore fitness, termed compensatory adaptation. This research seeks to address whether the effect of compensatory mutations promote speciation as rapidly as adaptive diversification in new environments. Asexually reproducing, haploid yeast were evolved by serial dilution in two novel selective environments, high salinity and limiting sugar. Wild type strains were evolved and compared to two separate strains each with a single knockout mutation, one of large deleterious effect and one small deleterious effect. Hybrids were created among pairs of strains with the same starting mutation including within and between novel environments. The degree of reproductive isolation over time was assessed by estimates of diploid hybrid fitness in the form of growth rate relative to ancestral genotypes, sporulation efficiency, spore viability, and haploid recombinant fitness. We postulate that populations with ancestral deleterious mutations will adapt and diverge more rapidly than wild type populations as they each adapt to novel environments. This research will shed light on the role of stabilizing selection in generating genetic diversification and biodiversity as well as the processes that lead to the compensation of congenital diseases and microbial resistance to antibiotics

via compensatory evolution. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

FITNESS COMPENSATION BY RECOMBINATION OF STANDING GENETIC VARIATION AS A MEANS FOR TRANSGENE STABILITY

Avery Williamson
Home Institution(s): North Carolina A&T State Univerisity
Category: Biological Sciences, Section 8
Location: 2250 EB, 11:30 AM
Mentor(s): Barry Williams (Zoology)

Transgenics is a fundamental aspect of modern bioengineering. Transgenes are often utilized in gene therapy, pharmaceutical production, industry, and agriculture. The dilemma is that exogenous transgenes can be inactivated by the defenses of the host organism. In addition, these transgenic mutations can be deleterious, lowering the overall fitness of the organism and increasing the probability that host adaptation will result in loss of the transgene. The objective of this study is to determine the feasibility of rapid compensatory adaptation for deleterious mutations through genetic recombination. We plan to integrate deleterious mutations in a diverse set of yeast strains, so that there is maximum genetic diversity among strains, but that all will carry the same deleterious mutation for each experiment. Because yeast can be maintained as stable haploids of opposite mating types, diploids, or spores of segregant diploids, we will randomly mate strains 'en mass' generating trillions of recombinants for each deleterious mutation examined. These recombinants will be screened for healthy progeny and verified that the exogenous deleterious mutation is still present with PCR genotyping. Subsequently, we will repeat the previous steps with different combinations and numbers of yeast strains to determine the relationship between compensatory adaptation by recombination and genetic diversity in the mating population. This will allow us to assess the degree of recombination required to compensate for the deleterious mutations and thus potentially identify a novel means for transgene stability in the bioengineering of sexually reproducing organisms.

DEVELOPING VISUAL LIBRARY OF ABDOMINAL AORTIC ANEURYSMS FROM MEDICAL IMAGES

Daron Spence
Home Institution(s): Grambling State University
Category: Biological Sciences, Section 8
Location: 2250 EB, 11:45 AM
Mentor(s): Seungik Baek (Mechanical Engineering)

Compiling medical images is critical in the diagnosis, monitoring and maintenance of Abdominal Aortic Aneurysms (AAA). In this project we used the computer program Simpleware with medical CT images of AAA to construct a collection of 3-dimensional models to provide a panoramic view of the condition. Outputs from CT scans were normalized to a specified size and resolution for the 3 dimensional anatomical modeling. Each image was then processed using a series of segmenting and filtering techniques used to isolate key regions of interest. After identifying the desired areas, we created a 3-dimensional depiction of the patient's abdominal aortic aneurysm and surrounding organs. Accurate 3d modeling of AAA will lend way to computational simulation of aneurysm growth, giving more insight into the morphology of the ailment. Creating these visual libraries archives a variety of aneurysms which can then be referred to when taking cautious measures. More importantly it will assist the communication of the science among related groups as well as cohorts in other disciplines.

THE EFFECT OF MLK INHIBITOR ON TUMORIGENIC ABILITY AND MAPK SIGNALING IN AN OVARIAN CANCER CELL LINE

Neco Wilson
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 9
Location: 3405A EB, 10:45 AM
Mentor(s): Kathy Gallo (Physiology), Elahé Crockett (Medicine)

Ovarian cancer is the fifth leading cause of cancer deaths in US women and is the deadliest of all gynecologic cancers. Because ovarian cancer is difficult to detect, 75% of patients have metastases at the time of diagnosis. Metastases most frequently occur in the abdominal cavity as well as in the gastrointestinal tract, liver, bladder, and spleen. New therapeutic strategies for treating the ovarian cancer are urgently needed. The aim of this study is to evaluate the effect of an inhibitor that targets MAPK signaling pathways on the tumorigenic potential of a human ovarian cancer cell line. In this project, the human ovarian cancer cell lines SKOV3 and SKOV3-luc-RFP are being used. SKOV3-luc-RFP is a version of SKOV3 which has been engineered to express a firefly luciferase and a red fluorescence protein. To evaluate the effect of the inhibitor on tumorigenic potential, soft agar colony formation assays are being performed. The impact of the inhibitor on MAPK signaling pathways in the ovarian cancer cell lines will be investigated by Western Blotting with active MAPK-specific antibodies. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

POINT MUTATION ON THE VPR REGION OF THE HIV-1 GENOME

Niedra Wilson
Home Institution(s): Bennett College
Category: Biological Sciences, Section 9
Location: 3405A EB, 11:00 AM
Mentor(s): Yong-Hui Zheng (Microbiology and Molecular Genetics)

The main focus of this research lab is to stop HIV-1 from replicating by mutating the viral protein R region of the virus. VPR has multiple functions in helping HIV to attack the immune system by targeting T-cells, and non-dividing cells such as macrophages. The designed primers that were constructed in the lab are to mutate the VPR gene. A polymerase chain reaction will amplify the VPR region of the virus so that a point mutation can be introduced. The technique used for the point mutation is called Site-directed mutagenesis. This particular area of the sequence that will be tested is Q65R and R80A. These two mutations will be used to study the mechanism of VPR activity.

SOLUTIONS THAT AFFECT QPCR IN AN EFFICIENT AND PRODUCTIVE WAY

Alexander Woods
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 9
Location: 3405A EB, 11:15 AM
Mentor(s): Monique Floer (Biochemistry and Molecular Biology)

Quantitative Polymerase Chain Reaction (qPCR) is a technique that allows DNA to be multiplied into larger strands and then quantified; which means that the double helix strands are counted as their numbers increase. This process has numerous applications in biology dealing with DNA. It is very helpful, but can be difficult due to primer dimer formation, dying samples overnight, some samples are hard to amplify because they contain repeated DNA sequences, and due to certain concentration levels of multiple or single reactants. I will investigate and try to find a solution for the best way to amplify PCR that would allow my team to have a greater coverage of specific regions of genomic DNA so that we could pinpoint exactly where nucleosomes are positioned in these regions. Being able to determine the locations of these nucleosomes is imperative to the project because it could possibly tell us how cells of different tissues express certain traits that allow them to become stomach cells, muscle cells, brain cells, etc. The solutions that could improve qPCR are dimethylsulfoxide, ammonium sulfate, glycerol, and PEG. The accuracy of this test is very important because PCR tests can be used in the medical and criminal field where a

slight difference of accuracy could change the results of the test and ultimately cause harm. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

YEAST ONE HYBRID ASSAY HSFB2A
Linda Yuen
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 9
Location: 3405A EB, 11:30 AM
Mentor(s): Pingsha Hu (Plant Biology)

The main purpose of yeast one hybrid assay is to determine the hologous transcription factors that can interact with a specific DNA regulatory sequence. The yeast one hybrid assay was used to determine if there were any interactions between transcription factor and the promoters. Results tested with the promoters and the gene of HSFB2A had shown that there was positive interaction and that more tests need to be done to validate the yeast one-hybrid assay results. A ten-fold interaction map was made to show that certain promoters are linked with certain transcription factors. The ten-fold interaction map indicates that certain promoters such as GAPA, LHCB3, PSAL and LUT1 has a positive interaction with HSFB2A. HSFB2a belongs to a specific group of transcription factor called heat shock factor. Specifically, HSFB2a belongs to heat shock factor class B region that acts as an activator and a repressor. This transcription factors help regulate the expression of heat shock proteins under stress conditions. The purpose of this experiment is to help validate the results from yeast one hybrid assay and can help further research on photosynthetic genes.

Poster Presentations

ASSAY OF GLYCEROL DEHYDROGENASE USING UV-VIS SPECTROSCOPY
Kyle Anderson
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Poster Number: 1
Time: 9:15-10:30 AM
Mentor(s): Scott Calabrese Barton (Chemical Engineering), Hanzi Li (Chemical Engineering)

Dihydroxyacetone (DHA) is an important ingredient in sunless tanning products. Many bacteria contain an enzyme that converts glycerol, a byproduct of biodiesel production, to DHA through a reversible reaction involving NAD+/NADH as a cofactor. Recent politics have caused biodiesel production to jump, and this process would take advantage of the corresponding depression in the glycerol market while reducing the cost of DHA. For this purpose, the kinetic parameters of the glycerol dehydrogenase enzyme isolated from E. coli were investigated. The enzyme was analyzed using UV-Vis Spectroscopy to monitor NADH production/use at various initial species concentrations for both the forward and reverse reactions, with and without product inhibition. Apparent kinetic parameters were obtained from the data using the Michaelis-Menten kinetic equations. Literature has shown that this type of enzyme typically follows Ordered Bi-Bi kinetics in which the coenzyme binds to the enzyme first, followed by the substrate, and the resulting product unbinds first, followed by the coenzyme. The experimentally-obtained kinetic parameters, along with a mathematical model specifically created for this type of inhibition, were entered into MATLAB and used to find the actual kinetic parameters of the enzyme. Future work will involve incorporating this reaction into a bioconversion process that utilizes bioelectrocatalysis to cheaply regenerate the cofactor.

INVESTIGATING THE EFFECT OF CANRENOIC ACID IN HYPOPERFUSED WISTAR RATS

Tifini Batts
Home Institution(s): Meharry Medical College
Category: Biological Sciences, Section 1
Poster Number: 2
Time: 9:15-10:30 AM
Mentor(s): Anne Dorrance (Pharmacology and Toxicology), Johnathon McClain (Pharmacology and Toxicology)

Dementia is a neurodegenerative disorder associated with age, diet, and cardiovascular complications, like small vessels disease. Long term declines in blood flow (hypoperfusion) can result in cell death and promote for vascular dementia (VaD; loss of cognitive function). In conditions that promote VaD, there is an upregulation of aldosterone, oxidative stress, etc. Previous studies have shown that the damage from the independent mechanisms of hypoperfusion can be reduced by drug therapies, like polyphenols and edavarone. In this study, it is hypothesized that hypoperfusion will promote a significant decline in cognitive function, but that canrenoic acid will inhibit the aldosterone- hypoperfusion mechanism, reducing cerebral damage. To test this, male Wistar Kyoto rats will be divided into 3 groups of 10 (sham, hypoperfusion, and hypoperfusion with canrenoic acid treatment administered at a 20 mg/kg/day rate in the rats' drinking water). Similar surgeries will be done amongst all groups, but in the sham group, the ligation of the carotid arteries will not be as severe as in the hypoperfusion rats. Post-hypoperfusion surgery, brain function will be measured via Morris Water Maze and activity box analysis. Activity box analysis has shown a significant difference exists in the amount of rearing, rest, and movement times between the sham and hypoperfusion groups, suggesting different levels of cognitive and locomotor function. Over time, if the hypoperfused rats with the canrenoic acid diet have improved cognitive function it can be inferred that canrenoic inhibits cerebral degeneration induced by aldosterone.

EFFECT OF ABIOTIC STRESSES (DROUGHT, SALT AND OSMOTIC) ON THE EXPRESSION OF LIPID ASSOCIATED FAMILY PROTEIN (PLAFP) IN ARABIDOPS

T. Ian Beddows
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Poster Number: 3
Time: 9:15-10:30 AM
Mentor(s): Susanne Hoffmann-Benning (Biochemistry), Banita Tamot (Biochemistry)

Plants have evolved a phloem-mediated mechanism to convey stress signals generated in one part of the plant to the others. Although the phloem is recognized as a mediator of long-distance signaling in vascular plants, the biochemical pathways involved in long-distance stress signaling have not been fully elucidated. The presence of lipids and lipid binding proteins in the phloem indicates that long-distance phloem-mediated signaling via lipids could be an important aspect of stress response. PLAFP is one of the fourteen putative lipid binding proteins that were identified in the proteomic analysis of Arabidopsis phloem sap. PLAFP contains a PLAT/LH2 domain which is known to be stress induced. Analysis of lipid binding characteristics of PLAFP showed that it binds phosphatidic acid, a known stress signaling lipid also found in A. thaliana's phloem exudate. On the basis of 1) the phloem localization of PLAFP and PA, 2) PLAFP's PLAT/LH2 domain, and 3) PLAFP's binding of PA, we hypothesize that PLAFP is involved in phloem-mediated long-distance stress signaling. To test our hypothesis, 2-3 week old A. thaliana seedlings were exposed to drought, salt, and osmotic stresses, and PLAFP's relative mRNA level was determined using semi-quantitative RT-PCR. In addition, changes in the protein expression pattern in response to stress were analyzed using a promoter-GUS assay. Here we present our results on the effect of drought, salt, and osmotic stresses on PLAFP expression.

CHARACTERIZATION OF THE INTERACTION BETWEEN CBPA, A SURFACE VIRULENT FACTOR OF S. PNEUMONIAE, AND HUMAN FACTOR H, A COMPLEMENT S

Lestella Bell
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 1
Poster Number: 4
Time: 9:15-10:30 AM
Mentor(s): Yan Honggao (Biochemistry)

Streptococcus pneumoniae (S. pneumoniae) is a major cause of several bacterial infections such as otitis media, pneumonia, and meningitis. The exact mechanism by which S. pneumoniae evades host's immune system is not clearly known. Recent studies suggest that S. pneumoniae evade phagocytosis mediated by the host's immune system by recruiting a negative complement regulator, factor H (FH), to its surface. All virulent strains of S. pneumoniae tested to date contain a gene for the surface protein CbpA. CbpA binds to the FH protein via its N-terminal domain and this interaction helps S. pneumoniae to evade complement-mediated phagocytosis. FH is a large glycoprotein abundant in plasma and is composed of 20 short consensus repeats (SCR). It remains controversial which of the 20 SCRs of FH are responsible for the binding of CbpA. The long term goal of Dr. Yan's lab is to gain a better understanding of the molecular details of S. pneumoniae-host interaction and to evaluate the possibility of disrupting this interaction as a strategy to prevent infections caused by this bacterium. Our specific goals are to over express and isolate functional FH proteins from E. coli, to establish the region of FH that interacts with CbpA, and to determine if this reaction is consistent across variants of CbpA found in S. pneuominae. In future we aim to characterize the purified proteins and to evaluate their potential to be used in both biochemical and biophysical methods focused on probing the molecular details of FH-CbpA interactions.

PEROXISOMAL PROTEIN EFFECT ON PATHOGEN RESPONSE IN ARABIDOPSIS THALIANA AND PEROXISOMAL TARGETING OF THE GAPC1/2 GENE

Rachel Capouya
Home Institution(s): University of Georgia
Category: Biological Sciences, Section 1
Poster Number: 5
Time: 9:15-10:30 AM
Mentor(s): Jiying Li (Genetics Program), Jianping Hu (Plant Biology)

Peroxisomes are eukaryotic organelles that house enzymes crucial to several metabolic pathways, including fatty acid (BETA)-oxidation, synthesis of jasmonic acid, and the pentose phosphate pathway. A key function of peroxisomes is also the production and reduction/detoxification of hydrogen peroxide (H2O2). Previous studies, including those conducted by the Hu lab, have indicated a strong link between peroxisomal function and plant resistance to non-host pathogens. We acquired and examined Arabidopsis thaliana mutants of genes encoding peroxisomal proteins that either produce or reduce H2O2, and how these mutations affected plant defense responses to invading pathogens. To determine if there was a change in defensive response in the mutant plants, we used the 22 amino acid peptide flagellin-22, a pathogen-associated peptide, to induce callose deposition in plant leaves. As callose is an indicator of defensive response against a pathogen, we are able to determine which mutants have reduced or enhanced immunity response when encountered by pathogen. We also conducted a localization study of the GAPC1 and GAPC2 genes. The GAPDH gene in fungi exists in a peroxisome-targeted isoform with a peroxisome targeting signal, SRL. A blast of the GAPDH sequence against the Arabidopsis genome revealed possible homologs in the similarly-sequenced GAPC1 and GAPC2 genes, which both contain a potentially novel peroxisome targeting sequence, SKA. Using cloning methods and fluorescent protein visualization techniques, we observed the localization of these respective gene products in tobacco leaves to examine whether those genes are targeted to peroxisomes by SKA.

SUPPRESSION OF CD40-INDUCED B CELL ACTIVATION BY DELTA-9-TETRAHYDROCANNABINOL IN MOUSE PRIMARY B LYMPHOCYTES

Stephen Carney
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Poster Number: 6
Time: 10:45 AM - 12:00 PM
Mentor(s): Norbert Kaminski (Pharmacology and Toxicology), Thitirat Ngaotepprutaram (Pharmacology and Toxicology)

Δ^9-tetrahydrocannabinol (Δ^9-THC), a plant-derived cannabinoid that binds to cannabinoid receptor 1 and 2 (CB_1/CB_2), has previously showed to impair CD40-induced primary immunoglobulin M (IgM) production in mouse splenic B cells. The interaction between CD40 and CD40 ligand (CD40L) stimulates B cells to up-regulate the expression of co-stimulatory molecules CD80 and CD86. It was hypothesized that Δ^9-THC would suppress B cell activation by impeded the up-regulation of CD80 and CD86 at both protein and mRNA level in a cannabinoid receptor dependent mechanism. Mouse fibroblast stably transfected with human CD40L gene were implemented to stimulate B cell activation in vitro. In the presence and absence of Δ^9-THC, surface protein expression will be measured by flow cytometry on day 3 to obtain gated percentages. The effect of Δ9-THC on the mRNA level will be assessed by quantitative real-time PCR (qRT-PCR). RNA samples were isolated from 4 wild-type and 4 CB1/CB2 knockout mice spleens to be converted into cDNA using the PCR machine. Using the $2^{-\Delta\Delta CT}$ method, threshold cycle was presented as the fold change in gene expression normalized to an endogenous reference (18S rRNA) and relative to the untreated control (0.02% DMSO). We analyzed qRT-PCR data with one-way ANOVA for comparison among the treat groups and Dunnett's post-hoc test to identify statistical significance. We expected inactivation of CD80 and CD86 on B cell surface and inhibition of mRNA coding at increasing Δ^9-THC levels in both mice groups.

THE PRO-OXIDATIVE, PRO-INFLAMMATORY, AND CYTOTOXIC EFFECTS OF DIESEL EXHAUST PARTICLES

Janessa Esquible
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Poster Number: 7
Time: 10:45 AM - 12:00 PM
Mentor(s): Ning Li (Pathobiology and Diagnostic Investigation)

Background: Oxidative stress, induced by particulate matter (PM) including diesel exhaust particles (DEP) is an important contributing factor to cardiorespiratory diseases. We've recently obtained a new collection of DEP from Japan which will be used for our future in vivo studies. The objective of this study is to characterize DEP and their ability to induce pro-oxidative, pro-inflammatory and toxic effects at a cellular level so that the optimal dose and exposure time in animal experiments can be determined. Materials and Methods: Mouse macrophage cell line (RAW 264.7) will be stimulated with different doses of DEP for 6 to 16 hours. Cellular oxidative stress will be determined by the induction of antioxidant enzyme heme oxygenase-1 (HO-1) using the Western Blot method. Cytokine production (TNF ?, MCP-1) will be measured by ELISA. Trypan-blue will be used to assess DEP induced cell viability. Results: We anticipate a dose-dependent cellular response to DEP stimulation. At low dose, DEP would result in induction of HO-1. An intermediate dose would lead to an increase in the production of pro-inflammatory cytokines. A high dose of DEP could cause cell death. Conclusions: These data will provide important information to help us to design our future animal studies. Discussion: Cellular anti-oxidant system protects the cells from oxidative stress, including that induced by DEP. However, the level of oxidative stress overwhelms this defense, leading to inflammation, as determined by increased cytokine production. Finally, extremely high levels of oxidative stress may cause mitochondrion damage, leading to cell death.

OPTIMIZING THE MONOLIGNOL BIOSYNTHETIC PATHWAY FOR PRODUCTION OF CONIFERYL FERULATE IN ARABIDOPSIS

Nicholas Fernandez
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Poster Number: 8
Time: 10:45 AM - 12:00 PM
Mentor(s): Curtis Wilkerson (Plant Biology, Biochemistry and Molecular Biology)

The lignin composition of plant cell walls is the major impediment to enzymatic digestion of biomass. Alteration of lignin structure without affecting the argronomic properties of plants is a major goal in our efforts to produce cheaper biofuels. A monolignol, coniferyl ferulate, when incorporated into lignin introduces reactive ester linkages that diminish the harshness of the conditions required for delignification that would make biofuel production more cost efficient. Our immediate goal is to produce plants with such a modified lignin. Ferulate monolignal transferase (FMT) is an enzyme recently identified from Angelica sinensis that produces coniferyl ferulate from coniferyl alcohol and feruloyl-CoA. Transforming Arabidopsis thaliana to express FMT may lead to the incorporation of coniferyl ferulate into lignin. FMT homologs from other species are also being investigated to identify an enzyme ideal for coniferyl ferulate production in plants. Cinnamoyl-CoA reductase 1 (CCR1) is an Arabidopsis gene that produces an enzyme that catalyzes the reduction of feruloyl-CoA to coniferolaldehyde and could limit the activity of FMT in Arabadopsis by competing for the substrate feruloyl-CoA. Expression of CCR1 was knocked down in Arabidopsis plants expressing FMT using an RNA interference strategy, to increase the amount of feruloyl-CoA available for use by FMT. To determine the effectiveness of our approach we are measuring coniferyl ferylate levels from these transgenic lines. If successful, a similar technique could be used to modify lignin in other plants, such as corn, sorghum, poplar, or switchgrass, which are used for biofuel production.

OIL METABOLISM IN GREEN ALGAE

Nicholas Pokorzynski
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 4
Poster Number: 9
Time: 10:45 AM - 12:00 PM
Mentor(s): Bensheng Liu (Biochemistry)

The unicellular green alga Chlamydomonas reinhardtii provides a useful model organism for studying characteristics representative of other algal species. It is well established that under Nitrogen depravation conditions the storage lipid Triacylglycerol (TAG) content of Chlamydomonas increases greatly. As petroleum prices continue to rise, TAG produced in algae could prove to be a useful biofuel feedstock. Identification and characterization of Chlamydomonas mutants that express unique lipid phenotypes can be useful in gaining a more comprehensive understanding of the way lipids are synthesized within algal species. A mutant pool was generated by insertional mutagenesis and was subjected to a high-throughput screening via Nile Red staining. Lines selected from this screening were tested to observe their TAG phenotype by Thin-layer Chromatography – Gas Chromatography (TLC-GC). High or low TAG mutants were identified from this pool and determined to have disruption in lipid related gene(s). This presentation will detail the characterization of Chlamydomonas lipid mutant strains.

INHIBITION OF DXR ENZYME INVOLVED IN THE MEP PATHWAY BY ISOPENTENYL DIPHOSPHATE
Glenn Galle
Home Institution(s): Lake Superior State University
Category: Biological Sciences, Section 4
Poster Number: 10
Time: 10:45 AM - 12:00 PM
Mentor(s): Aparajita Banerjee (Biochemistry), Thomas Sharkey (Biochemistry)

Isoprene is a volatile hydrocarbon emitted from different plant in response to abiotic stressors, primarily short heat flecks. Dimethylallyl diphosphate (DMADP), the precursor of isoprene in plants, is synthesized by the 2-C-methyl-D-erythritol 4-phosphate (MEP) pathway. 1-deoxy-D-xylulose 5-phosphate reductoisomerase (DXR) is the second enzyme in the MEP pathway and helps to catalyze the reaction of 1-deoxy-D-xylulose 5-phosphate (DXP) into 2-C-methyl-D-erythritol 4-phosphate (MEP). MEP is finally converted to dimethylallyl diphosphate (DMADP) through several other enzymatic reactions. Isopentenyl diphosphate (IDP) is an isomer of DMADP and has been thought to show some feedback inhibition on the DXR enzyme at high concentrations. Spectrophotometric assays of DXR were performed to study the inhibitory effects of IDP on the DXR enzyme. Results suggest that at high concentrations of IDP (>1 mM) DXR activity is inhibited by up to 67%. Preliminary data has shown that IDP has a Ki around 3 mM which is much higher than originally anticipated for DXR inhibition.

S-NITROSOGLUTATHIONE INHIBITION OF TISSUE FACTOR IN HUMAN MACROPHAGES
Briahna Hardaway
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Poster Number: 11
Time: 9:15-10:45 AM
Mentor(s): James Luyendyk (Pathobiology and Diagnostic Investigation)

Tissue factor (TF) is the cellular receptor for coagulation FVIIa and the primary activator of the extrinsic pathway of blood coagulation. Coagulation cascade activation in metabolic diseases such as obesity is triggered by TF expressed by monocytes/macrophages. To this end, pharmacologic strategies aimed at reducing TF expression by these cells may yield novel treatments for metabolic disease. Previous studies have shown that inhibition of S-nitrosoglutathione reductase (GSNOR) in the macrophage cell line RAW 264.7 cells significantly reduced lipopolysaccharide (LPS) activation of the transcription factor nuclear factor-κB, a potential transcriptional activator of TF expression. We hypothesize that GSNOR enhances LPS induction of TF in macrophages by reducing intracellular levels of S-nitrosoglutathione (GSNO). RAW 264.7 cells will be pretreated with various concentrations of GSNO or GSNOR inhibitor and subsequently stimulated with various concentrations of LPS for various times. TF expression and activity will be monitored by real-time PCR and single stage clotting assay, respectively. We anticipate that either addition of exogenous GSNO or inhibition of GSNOR-mediated GSNO metabolism will significantly inhibit LPS induction of tissue factor expression.

UNDERSTANDING THE MECHANISM WHEREBY THE TRANSCRIPTION FACTOR ZAT12 IS COLD-INDUCED BY EXAMINING INTERACTION WITH THE MYB017GENE
La'Mayah Hodges
Home Institution(s): Spelman College
Category: Biological Sciences, Section 2
Poster Number: 12
Time: 9:15-10:30 AM
Mentor(s): YongSig Kim (Plant Biology)

As a result of their sessile nature, plants have evolved complex ways to adapt to various environment stresses imposed upon them. Cold acclimation refers to a plant's ability to increase freezing tolerance in response to non-freezing, cold temperatures. In Arabidopsis thaliana, various genes have shown to be up-regulated in response to low temperature including genes that encode the transcription factors CBF1, CBF2, CBF3, ZAT10, and ZAT12. The

mechanism whereby the ZAT12 gene is cold-induced is vaguely understood thus, a yeast one hybrid screen was performed to identify proteins that bind to the ZAT12 promoter region. The MYB107 transcription factor was identified as being a ZAT12 binding protein. In an attempt to determine the significance of this interaction, homozygous MYB107 over-expression lines as well as a T-DNA knockout mutant were obtained, cold treated at 4°C for varying intervals of time, and a quantitative PCR assay was performed to determine the transcript levels of MYB107 and ZAT12. Results of qPCR analysis are forthcoming.

THE ROLE OF THE DEGENERATE VIBRIO CHOLERAE DIGUANYLATE CYCLACE VCA0965 IN CYCLIC-DI-GMP PRODUCTION, BIOFILM FORMATION AND MOTILI

Jessica Hunter
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Poster Number: 13
Time: 9:15-10:30 AM
Mentor(s): Christopher Waters (Microbiology and Molecular Genetics)

Biofilms are multicellular communities encased in a protective extracellular matrix and are of great importance to human health due to their ability to cause chronic, recurrent infections. Diguanylate cyclases (DGCs) are bacterial enzymes of crucial importance to biofilm formation because of their ability to make the second messenger cyclic di-GMP (c-di-GMP). In the majority of bacteria, c-di-GMP plays an important role in biofilm formation and motility (bacterial swimming). DGC activity is believed to be dependent on a GG(D/E)EF active site motif, however approximately 25% of known DGCs are predicted to have a degenerate active site. The Vibrio cholerae protein VCA0965 is a DGC presumed to be inactive because it possesses a degenerate AGDEF active site. We have shown that overexpression of VCA0965 in V. cholerae causes a two-fold reduction in motility and increased biofilm formation. Additionally, we found that inactivation of the allosteric inhibitory domain of VCA0965 by site-specific mutagenesis and overexpresion of the resulting protein in V. cholerae resulted in greater motility repression, hyper-biofilm formation, and a significant increase in c-di-GMP levels. Furthermore, we detected c-di-GMP production when VCA0965 was overexpressed in Escherichia coli BL21(DE3), which does not produce c-di-GMP. Based on these results, we conclude that VCA0965 is capable of synthesizing c-di-GMP. This suggests that the GG(D/E)EF motif is more tolerant of substitutions than is currently believed and that many of the DGCs predicted to be inactive may actually be able to make c-di-GMP.

THE POSSIBILITY OF SECOND MESSENGER LIGHT RESPONSE IN CYANOBACTERIA

Hildy Joseph
Home Institution(s): Kenyon College
Category: Biological Sciences, Section 2
Poster Number: 14
Time: 9:15-10:30 AM
Mentor(s): Marco Agostoni (Plant Biology), Beronda Montgomery (Plant Biology), Chris Waters (Microbiology)

The ubiquitous bacterial second messenger bis-(3'-5-')-cyclic dimeric gyuanosine monophosphate (c-di-GMP) stimulates the production of biofilm, which affects several bacterial functions, including motility and response to pathogens. C-di-GMP levels are controlled by two enzymes; diguanylate cyclases (DGCs) catalyze the formation of c-di-GMP from two molecules of GTP while phosphodiesterases (PDEs) linearize c-di-GMP into 5'-phosophoguanylyl-(3'-5')-guanosine and ultimately split it into two GMP molecules. Two common bacterial domains, GGDEF and EAL, comprise the active sites of DGCs and PDEs respectively. Cyanobacteria are photosynthetic prokaryotes from which modern chloroplasts are ancestrally derived through endosymbiosis. Light input initiates many cyanobacterial pathways. Photoreceptors, such GAF domain proteins, absorb UV and visible light and subsequently bind chromophores. Chromophore binding is dependent on the absorption of specific wavelengths of light. Previous work suggests that light regulation may affect c-di-GMP levels in cyanobacteria. This study examines two genes, cdgA and cdgE, in Fremylla diplosiphon that possess a photosensory GAF domain as well as a GGDEF domain and an EAL domain that together modulate c-di-GMP levels. The genes will be both deleted and overexpressed in F. diplosiphon to determine the constitutive DGC or PDE function of each.

Furthermore, the proteins will be expressed in Escherichia coli that contain a chromophore-encoding plasmid to ascertain the possibility of light sensitivity. We have already shown that the full-length proteins cannot bind the chromophore in E. coli. However, further investigation investigation with specific protein domains is needed. This study will provide a greater understanding of cyanobacterial light response and the integration of light signals.

TDP-43 EXPRESSION IN PALMITIC ACID-INDUCED ASTROCYTE CELLS
Garrett Kohler
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 2
Poster Number: 15
Time: 9:15-10:30 AM
Mentor(s): Christina Chan (Biochemistry and Molecular Biology), Li Liu

The 43 kDa transactive response DNA-binding protein, TDP-43, has been found in 25-30% of sporadic cases of Alzheimer's disease, specifically in glial and neuronal inclusions. Presence of TDP-43 has been cited to be associated with hippocampal atrophy. In particular, hippocampal atrophy has been found to be greater in Alzheimer's disease with TDP-43 pathology compared to AD without hippocampal atrophy. Fatty acids, such as palmitic acid, caused AD-like changes in primary neurons through astrocytes' mediation as evidenced in previous in vitro studies. Small molecules like palmitic acid can pass through the blood brain barrier and be taken up by astrocytes in vivo. High levels of palmitic acid may increase the pathological change of astrocytes. Currently, little is known about the relation of TDP-43 related to a fatty acid environment. In this study, astrocyte cells are treated with a 0.4 mM palmitic acid solution for 12 hours. Using quantitative real-time PCR and confocal microscopy techniques, TDP-43 is found in cytosol (an abnormal situation) and mRNA levels of TDP-43 increased. The proposed mechanism by which the TDP-43 should be increased in astrocytes treated with palmitic acid is that they may be upregulated by potential transcription factors such as SP1 or c-Jun. This is possible because movement of TDP-43 to the cytosol is characteristic of the disease state. The increase in transcription factors lead to an increase in the level of TDP-43. Isolating TDP-43 as a novel target for therapeutic treatment has the potential to treat symptoms of dementia in Alzheimer's patients.

LIGHT CYCLING GENES IN NANNOCHLOROPSIS OCEANICA
Andrew Lapinsky
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Poster Number: 16
Time: 10:45 AM - 12:00 PM
Mentor(s): Eva Farre (Plant Biology)

Nannochloropsis oceanica is a marine microalgae that has the ability to produce and store substantial quantities of oils and carbohydrates. This makes it a promising candidate for biofuel production. Many fundamental processes, such as cell cycle and lipid production, are diurnally regulated in algae and presumably Nannochloropsis. The overall goal of this project is to establish standardized diurnal growth conditions for Nannochloropsis and identify gene expression patterns that occur during 24-hour light-dark cycles. Target genes were selected using the annotated genome of Nannochloropsis provided by our collaborators. In order to identify genes that could be used as controls for diurnally regulated gene expression, we searched the genome for regions homologous to known non-cycling genes in other algae and plants. The expression of these genes is measured over the course of a diel light-dark cycle using quantitative RT-PCR (RT-qPCR). The varying amounts of genetic material yielded at each time point can tell us if the genes cycle or not. Genes found to cycle will be studied in more detail. Additionally, the growth conditions established here will be used to study genome wide cycling gene expression using next generation RNA-seq technology in future experiments.

UTILIZATION OF A TARGETED CANDIDATE GENE APPROACH TO IDENTIFY THE GENE RESPONSIBLE FOR LUTESCENT 1 MUTATION OF TOMATO

Julia Miller
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Poster Number: 17
Time: 10:45 AM - 12:00 PM
Mentor(s): Cornelius Barry (Horticulture)

Chloroplasts serve as sites for photosynthesis and for the synthesis of primary and specialized metabolites. Characterization of chloroplast mutants facilitates understanding of the biochemical processes that occur in chloroplasts and their role in plant growth. The lutescent 1 (l1) and lutescent 2 (l2) mutants of tomato (Solanum lycopersicum) have identical phenotypes indicative of chloroplast defects. They display enhanced rates of chlorophyll loss in leaves and fruits as they age and seedlings are slow to de-etiolate. The l2 mutant maps to tomato chromosome 10 and causes a premature stop codon in a chloroplast targeted zinc metalloprotease of the M50 family of unknown function. The l1 mutant maps to the short arm of chromosome 8 but the underlying gene is unknown. Identifying the underlying gene responsible for the l1 phenotype may allow greater understanding of the role of l2. Based on the similarity of mutant phenotypes between l1 and l2, we hypothesized that l1 also encodes a plastid targeted protein. Nine genes from within the l1 mapping interval were found to contain a plastid targeting sequence. Eight l1 mutant alleles are available, included alleles induced by mutagens expected to cause deletions. Utilizing a combination of PCR amplification of candidate genes from cDNA and genomic DNA, coupled with sequence analysis, it is anticipated that a candidate gene for the l1 locus will be identified. An update of progress will be provided.

CHARACTERIZATION OF THE PHYSIOLOGICAL AND ENVIRONMENTAL REQUIREMENTS FOR ISOPRENE-MEDIATED THERMOTOLERANCE

Jonathan Montgomery
Home Institution(s): Humboldt State University
Category: Biological Sciences, Section 5
Poster Number: 18
Time: 10:45 AM - 12:00 PM
Mentor(s): Chris Harvey (Biochemistry)

Isoprene is a volatile hydrocarbon produced by certain plants in a temperature and light-dependent manner. It is the most heavily emitted plant-based hydrocarbon, and contributes significantly to atmospheric pollution. It has been demonstrated that isoprene prevents photosynthetic damage due to heat stress (the isoprene effect), but its mode of action is unknown. Debate continues as to whether isoprene acts through intercalation into and stabilization of the thylakoid membrane or quenching of reactive oxygen species produced in response to heat stress. Furthermore, though the isoprene effect has been observed repeatedly, it is often difficult to reproduce, and isoprene has been reported to exacerbate heat damage to photosynthesis. The delicacy of the isoprene effect suggests the need for specific environmental and/or physiological conditions during a heat stress event in order for isoprene to be beneficial. The goal of this project is to create a more detailed characterization of the isoprene effect, and in doing so, potentially provide clues as to isoprene's mode of action.

EXPRESSION OF A FERULATE MONOLIGNOL TRANSFERASE IN ARABIDOPSIS AND CLONING OF A CINNAMOYL-COENZYME A REDUCTASE RNAI CONSTRUCT

Patrick Ropp
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 5
Poster Number: 19
Time: 10:45 AM - 12:00 PM
Mentor(s): Curtis Wilkerson (Plant Biology, Biochemistry and Molecular Biology)

With world oil production not likely to increase and an increasing demand for energy, the development of biofuels is an important avenue for research and development. One major source of fuel is the conversion of polysaccharides and cellulosic material into ethanol or other compounds. Lignin, a significant constituent of plant biomass, is the major obstacle to enzymatic digestion of biomass to produce biofuels. Removal of lignin requires high temperatures and chemical treatments, which reduces the amount of net energy produced. A possible solution to this problem involves the substitution of normal lignin with an altered lignin whose structure can be more easily broken. One way this can be achieved is by incorporating coniferyl ferulate into the lignin. Ferulate monolignol transferase (FMT) is an enzyme that synthesizes coniferyl ferulate. We have cloned this gene from Angelica sinensis and overexpressed it in Arabidopsis. Using reverse transcriptase PCR, I have screened Arabidopsis plants for high levels of FMT expression. A complication in producing plants with coniferyl ferulate incorporated in lignin is the low levels of feruloyl-CoA, one of the substrates of FMT. In response, we created an RNA interference construct to lower expression levels of another enzyme in the lignin pathway that competes for feruloyl CoA, cinnamoyl-coenzyme A reductase (CCR1). CCR1 expression levels can be reduced by RNAi to reduce consumption of feruloyl-CoA and potentially increase yield of coniferyl ferulate in the plant for integration into the lignin. We are currently screening plants to determine if our strategy has been successful.

CHARACTERIZATION OF NEW CANDIDATE GENES IN ATROPA BELLADONNA INVOLVED IN TROPANE ALKALOID BIOSYNTHESIS

Ivan Rueda
Home Institution(s): California State University, Northridge
Category: Biological Sciences, Section 5
Poster Number: 20
Time: 10:45 AM - 12:00 PM
Mentor(s): Cornelius Barry (Horticulture), Matthew Bedewitz (Horticulture)

Hyoscyamine and scopolamine are active ingredients in a number of medicinal drugs but lack a potent harvest source. Atropa belladonna naturally produces tropane alkaloids, atropine, a racemic mixture of D- and L-hyoscyamine, and scopolamine as secondary metabolites. Tropane alkaloids are synthesized in the roots of A. belladonna through a multistep pathway that is not fully defined. Using transcriptomics and coexpression analysis, several candidate genes were identified that may encode enzymes for the missing steps in tropane alkaloid biosynthesis including a cytochrome P450, an acyltransferase, and an acyl-activating enzyme. This study aims to characterize these genes and their role in tropane alkaloid biosynthesis using virus-induced gene silencing followed by LC-MS-MS of alkaloids in the silenced lines. Progress on the characterization of these genes will be provided.

UNDERSTANDING GENE EXPRESSION THROUGH MODELING IN DROSOPHILA MELANOGASTER

Benjamin Taylor, Irina Pushel
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 3
Poster Number: 21
Time: 9:15-10:30 AM
Mentor(s): David Arnosti (Biochemistry and Molecular Biology)

Gene regulation is a complex and highly dynamic process, the function of which is difficult to determine using standard biological techniques. Thermodynamic modeling has been used to examine transcriptional regulation of

gene expression, which could lead to significant advances in the study of development and disease. Our group has been investigating the regulation and expression of rhomboid, a dorsal-ventral patterning gene in Drosophila melanogaster. 120 model forms were used to investigate protein-protein cooperativity as well as the function of short-range repressors. These models were tested on a number of different input data sets, and model output was compared to normalized expression patterns from confocal images of early blastoderm stage D. melanogaster embryos. Model output was analyzed on three distinct levels to examine general regulatory trends as well as finer details specific to the rhomboid enhancer. 5-fold cross-validation and sensitivity analysis were used to ensure that observed effects were a result of the biological system rather than the mathematical formulation of the model. No consistent trends were observed in cross-validation, suggesting that the model is not over-fitting the data. The sensitivity analysis for virtually all model forms tested is highly similar, and suggests that the parameters of greatest interest are among the most sensitive in the model. The ability of certain models to accurately predict expression of dorsal-ventral patterning genes other than rhomboid indicates that these models likely present an accurate view of gene regulation.

BAYBERRY PROTEOME: SURFACE WAX BIOSYNTHESIS
Mark Taylor
Home Institution(s): University of South Carolina, Columbia
Category: Biological Sciences, Section 3
Poster Number: 22
Time: 9:15-10:30 AM
Mentor(s): John Ohlrogge (Plant Biology)

Lipids, specifically triacylglycerides (TAGs), represent eukaryotes' most efficient energy-storage molecules. As such, they interest biofuel investigators seeking to generate high-yield, sustainable energy systems. However, biofuel crops are normally harvested at senescence when lipids have been shunted to non-vegetative tissues, rendering them useless to bioenergy utility. Surface lipids, on the other hand, remain viable throughout development. By mass, northern bayberry (Myrica pensylvanica) accumulates the greatest proportion of surface lipid in nature as wax primarily composed of TAG. Its biosynthesis is governed by enzyme pathways, and the purpose of this project has been to elucidate these proteins. First, bayberry fruits, the sites of wax accumulation, were sequenced at different stages for their transciptomes. This RNA sequence data was then analyzed to give a global view of gene expression. Next, surface proteins were isolated for analysis by mass spectroscopy to reveal bayberry secretome composition and post-translational regulation. Based on these data, the Arabidopsis ortholog of bayberry's top-expressing gene, defective in cuticular ridges (DCR, At5g23940) was transfected to E. coli for an enzyme assay against a variety of molecules thought to be important substrates of this acyl transferase in a hitherto undescribed TAG-synthesis pathway.

MATHEMATICAL MODELING OF GENE EXPRESSION IN DROSOPHILA EMBRYOS
Marc Thompson
Home Institution(s): North Carolina A&T State University
Category: Biological Sciences, Section 3
Poster Number: 23
Time: 9:15-10:30 AM
Mentor(s): Chichia Chiu (Mathematics)

An organism's genome acts as its fundamental source of cellular regulatory functions. The travel of information from the genome to proteins generated through transcription controls nearly all cellular functions. With the ability to predict how genes are most efficiently activated and deactivated we will have a better understanding of life processes which will impact areas of biology ranging from a person's hair color to their susceptibility to disease. In order to develop an efficient predictor of gene expression we have generated a model of gene regulatory systems using Drosophila embryos which was compared to a preexisting data set of expression output. The embryos' intensity of gene expression was measured based on their nuclei and the time at which the measure of intensity was taken. Once the data was collected, we analyzed the model output data with the intention of creating a differential equations solver that will effectively simulate gene expression.

SITE DIRECTED MUTAGENESIS
Edmond Toma
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 3
Poster Number: 24
Time: 9:15-10:30 AM
Mentor(s): Honggao Yan (Biochemistry)

Site directed mutagenesis is a moleculoar biology engeneering technique in which a DNA molecule is mutated at a specific site. This allows one to produce different mutations of the same protein and discover the function of different sites on the protein. 1-Deoxy-d-xylulose 5-phosphate (DXP) reductoisomerase (DXR) is used as a catalyst in the 2-C-methyl-D-erythritol 4-phosphate (MEP) pathway. The MEP pathway is used in the synthesis of terpenoids in most microorganisms, apicoplasts of some protozoa, and plastids of plants; however animals synthesize terpenoids through a different pathway. This allows DXR to be a prime target in the development of drugs.

PROSTATE CANCER
Kyle Ulrich
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 3
Poster Number: 25
Time: 9:15-10:30 AM
Mentor(s): Eran Andrechek (Physiology)

First I looked on Pub Med to find datasets that fit a certain criteria for prostate cancer. After I had found datasets that fit the criteria we chose certain datasets that were on the correct platform and downloaded them to be normalized. After normalizing the datasets we will create PCA analyses to see if there are large variations between the data. Once this is done we can start to look at pathways that have a high probability in causing cancer.

RATIOS OF CYCLIC ELECTRON FLOW AROUND PHOTOSYSTEM I TO LINEAR ELECTRON FLOW IN VITRO IN C3 AND C4 SPECIES
Caroline Vallelian
Home Institution(s): University of Arkansas
Category: Biological Sciences, Section 6
Poster Number: 26
Time: 10:45 AM - 12:00 PM
Mentor(s): David Kramer (Biochemistry and Molecular Biology)

The light reactions of photosynthesis produce a fixed ATP:NADPH ratio of 1.3, while the Calvin-Benson cycle requires a ratio of 1.5. The resulting ATP deficit can be alleviated by several processes, one of which is cyclic electron flow around photosystem I (CEF1) In this process electrons are cycled back into the plastoquinone pool, generating additional proton motive force (pmf) and ATP, without generating NADPH. Physiological differences between species, such as protein or lipid biosynthesis, may alter chloroplast ATP requirements, and in turn alter CEF1 activity. In this study we have attempted to isolate intact, active chloroplasts and compare CEF1:LEF ratios in 5 species: spinach, pea, Arabidopsis thaliana, Zea mays, and Amaranthus retroflexus. Preliminary results suggest a correlation between predicted ATP requirements and their level of CEF1 activity in vitro.

MORPHOMETRIC ASSESSMENT OF CONCENTRATION- AND TIME-DEPENDENT INJURY IN THE NASAL AIRWAYS OF RATS EXPOSED TO CHLORINE GAS

Anthony Watkins, Jr.
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Poster Number: 27
Time: 10:45 AM - 12:00 PM
Mentor(s): Jack Harkema (Pathology and Toxicology)

Chlorine is an oxidizing chemical that is commonly used in industrial processes and as a household cleaner and disinfectant. It is also an inhaled toxicant that causes airway injury, ranging from minor irritation to death, depending on the exposure conditions. Understanding the airway pathology of inhaled chlorine is important for both preventing and treating toxic injury. In rodents, the nose is a primary target organ for chlorine toxicity. The present study was designed to determine the severity of nasal injury in rats exposed to various exposure regimens to determine the contribution of concentration (c) and time (t; duration) of exposure. We hypothesized that the exposure regimen, rather than the total dose, determines the manifestation and magnitude of chlorine-induced nasal pathology. Rats were exposed by inhalation to a constant dose delivered using different combinations of c x t (1 ppm for 5 days or 0.5 ppm for 10 days; 6h/day). The amount of histochemically stained mucus in nasal epithelium was morphometrically determined as a quantitative measure of chlorine-induced mucous cell metaplasia. Though rats were exposed to the same dose (c x t) of chlorine, those exposed to the higher c for the shorter t had significantly less intraepithelial mucus compared to rats exposed to the lower c for the longer t. These results support our overall hypothesis that exposure regimen rather than total dose is a better estimator of the severity of nasal injury caused by inhaled chlorine.

DETERMINING THE FUNCTION OF TRANSGLUTAMINASE IN THE RAT UTERUS AND CERVIX

Lindsey Young
Home Institution(s): Michigan State University
Category: Biological Sciences, Section 6
Poster Number: 28
Time: 10:45 AM - 12:00 PM
Mentor(s): Stephanie Watts (Pharmacology and Toxicology)

Parturition occurs when uterine smooth muscle (the myometrium) undergoes rhythmic contractions, which are dependent on contractile proteins actin and myosin. Transglutaminase (TG) is a family of enzymes that have the ability to modify contractile activity using various methods, such as protein cross-linking. The risk of preterm labor is significantly higher in women with celiac disease who are also seropositive for TG2 IgA antibodies. Based on this information, we speculate that TG may play a role in preterm labor. We hypothesized that TG1 and TG2 will be active in the pregnant and non-pregnant rat uterus and cervix. Immunofluorescent microscopy and immunohistochemical techniques were used. Active TG1 and TG2 were detected and localized in situ using a FITC-labeled peptide (K5 and T26, respectively, with K5QN and T26QN as their respective controls) in non-pregnant rat uterine and cervical tissues. TG1 activity was prominent in the epithelium of the cervix (n=7), and along the edges of the outer myometrium of the uterus (n=7). TG2 activity was noted in the body of the cervix (n=7), but was notably absent in the epithelium. In the uterus, TG2 activity was observed in the endometrium and entire myometrium (n=7). Preliminary work (brightfield immunohistochemistry) supports expression of TG1 and TG2 in the uterus and cervix, but the roles they play in these tissues are yet unknown. This study's goal was to help uncover a possible connection between TG and labor.

GENE EXPRESSION VARIATION AND HETEROSIS IN THE FREEZING TOLERANCE OF ARABIDOPSIS THALIANA POPULATIONS FROM SWEDEN AND ITALY

Cristina Zambrana-Echevarria
Home Institution(s): University of Puerto Rico, Mayaguez
Category: Biological Sciences, Section 6
Poster Number: 29
Time: 10:45 AM - 12:00 PM
Mentor(s): Christopher Oakley (Plant Biology), Douglas Schemske (W. K. Kellogg Biological Station)

Freezing temperatures limit the distribution of plant populations. To thrive in cold climates, plants must evolve mechanisms to perceive and tolerate freezing temperatures. This allows the adaptation of the populations and makes them more fit to their localization. Mechanisms that depend on temperature are well studied molecularly and have shown that plants sense non-freezing temperatures and cold acclimate in order to develop freezing tolerance. Several transcription factors regulate the expression of cold regulated genes after acclimation, like the family of genes CBF/DREB1. Two populations of A. thaliana from Sweden (SW) and Italy (IT) have shown to have local adaptation and different expression of freezing tolerance genes. Previous work has suggested that IT may have a dominant negative deletion in the cold regulation and response pathways. To assess the variation of gene expression within the same species and the presence of heterosis in freezing tolerance at a molecular level, we are studying four populations of A. thaliana, two from SW and two from IT. Different F1 hybrids between populations were obtained to compare with the parentals. Gene expression analysis using Quantitative PCR is on-going to identify up- or down-regulation of cold regulated genes in F1s and parentals of both populations. We are also evaluating the heterosis in freezing tolerance by the comparison of expression patterns between F1s and parentals. Thus, we expect to see similar variation of expression in the parentals of populations belonging to the same environment. Finally, we aim to prove if in fact the IT deletion has dominance effects.

Biosystems and Agricultural Engineering

Poster Presentations

HYDROCARBONS FROM BIOMASS FAST PYROLYSIS AND CATALYSIS
Kevin Andreassi
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster Number: 35
Time: 9:15-10:30 AM
Mentor(s): Christopher Saffron (Biosystems and Agricultural Engineering), Shantanu Kelkar (Biosystems and Agricultural Engineering)

Plant biomass based energy can provide local heat and power, use existing infrastructure, give impetus to the local economy and increase energy independence of communities, while being carbon neutral. Pyrolysis technologies offer a potentially less expensive route to hydrocarbon liquid fuels. Biomass fast pyrolysis involves the rapid heating of biomass in an inert atmosphere to intermediate temperatures. The products include a solid char, non-condensable gases and a condensable product, bio-oil. The quality and selectivity of pyrolysis products can be altered and improved by using heterogeneous catalysts. Catalytic upgrading of pyrolysis products removes oxygen in the form of coke and non-condensable gases and gives a product richer in hydrocarbons. Catalytic fast pyrolysis produces higher quality bio-oil and reduces the cost and intensity of downstream refining processes. Lab-scale experiments may be performed in a microscale analytical pyrolysis reactor such as a chromatography pyroprobe unit. In this study, the catalysts red mud, microporous and mesoporous sulfated zirconia, and mesoporous Al-MSU-S (Foam) and (Worm) were evaluated and compared with ZSM-5 for their potential to produce aromatic hydrocarbons. Catalyst properties such as surface area, pore volume and acidity were measured. Catalysts for upgrading poplar (DN-34) were examined using analytical pyrolysis and gas chromatography–mass spectrometry. The product yield, carbon selectivity and yield of hydrocarbon products were evaluated. The char and coke yields of these catalysts were estimated using a thermogravimetric analysis.

PHOSPHORUS ABSORPTION IN WASTEWATER USING IRON COATED MEDIA
Hayley Betker
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster Number: 36
Time: 9:15-10:30 AM
Mentor(s): Steven Safferman (Biosystems and Agricultural Engineering)

Phosphorus is used as a nutrient for growth in plants and crops working as an acid for nitrogen. The Nitrogen cycle includes a conversion to nitrogen gas causing a need it to be constantly replenished where as phosphorus is recycled and stays in the environment unless it is physically removed. As phosphorus cannot enter a gaseous state excess amounts build up in the soils and in water sources causing algae blooms, eutrophication, and other unbalanced nutrient problems. Although the algae blooms and eutrophication are natural biological processes that allow bodies of water to clean and regenerate themselves, to many nutrients such as phosphorus accelerate these biological progressions preventing domestic organisms from adapting to the new ecosystem. Toxic algae blooms have been known to have residual affects on cattle and can cause death in domestic pets. They can also have some effects on humans by inducing rashes, rotten smells, coughs, and impaired breathing. Iron is known to precipitate phosphorus and is often used to remove phosphorus from wastewater. By using iron coated media formed in unique porous shapes we are able to increase the amount of phosphorus absorbed. Our objective is to find the most productive way to absorb this phosphorus based on how much wastewater is put through the porous material. The size and shape of the media will be formatted based on the surface area needed to absorb the most phosphorus to a controlled amount of iron.

FE_3O_4@AU NANOPARTICLES FOR THE DETECTION OF ESCHERICHIA COLI O157:H7
Keely Chandler
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster Number: 37
Time: 9:15-10:30 AM
Mentor(s): Evangelyn Alocilja (Biosystems and Agricultural Engineering), Hanna Miller (Biosystems and Agricultural Engineering)

A gold coated iron oxide magnetic particle was developed that could be used as an extraction and detection tool for pathogenic cells in an electrochemical biosensor system. Previously reported Fe_3O_4@Au nanoparticles were synthesized using citrate as a capping agent. The Nano-Biosensors Lab at Michigan State University has recently developed a unique synthesis approach using dextrin as a capping agent. This new method produced particles with a stronger spectrophotometric absorption spectrum. The gold peak was confirmed using a potentiostat. For comparison, the gold coated Fe_3O_4 nanoparticles were functionalized with oriented antibodies using protein A and non-oriented antibodies through nonspecific adsorption. These were used to magnetically separate *Escherichia coli* O157:H7 from a broth matrix. The protein A and antibody concentrations were varied to determine the most effective concentration for the conjugate to maximize *E. coli* O157:H7 extraction. The nanoparticle-bacteria complex was applied to a modified screen printed carbon electrode. Voltage was applied and current was measured. Current peak was observed at 0.3 V, signifying the presence of bacteria and thus confirming the extraction. Preliminary results indicate that dextrin coated Fe_3O_4@Au nanoparticles could be used to report the presence of target bacteria in the biosensor. The ease of detection of the current signal in the Fe_3O_4@Au nanoparticles makes these novel particles a viable option for use in a biosensor system for the detection of harmful agents.

EFFECT OF IN-WOODS STORAGE ON WOODY BIOMASS MOISTURE CONTENT AND FUEL QUALITY
Kristen Henn
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 2
Poster Number: 38
Time: 10:45 AM - 12:00 PM
Mentor(s): Fei Pan (Biosystems and Agricultural Engineering)

Forest biomass used for bioenergy production, is expensive due to the high cost involved in harvesting operations. Drying of biomass during storage is imperative to make forest biomass a reliable, cost-effective energy source. Immediate on-site chipping has proven ineffective in maintaining energy content, while bundling technology was cost-prohibitive. This study evaluates piling tree limbs and tops for air-drying at the landing or roadside of the harvesting site. Samples were collected monthly from the top, middle, and bottom of randomly selected piles. Each sample was tested for moisture content, at the Michigan State University Forest Biomass Innovation Center in Escanaba, and higher heating value, using a bomb calorimeter at Michigan State University. It is hypothesized that natural drying will cause moisture content to decrease over time during storage, while the higher heating value will not change significantly.

EVALUATION OF BIORETENTION PLANT SPECIES UNDER FIELD CONDITIONS
Maddie Saylor, Stacey Stark
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 2
Poster Number: 39
Time: 10:45 AM - 12:00 PM
Mentor(s): Dawn Reinhold (Biosystems and Agricultural Engineering)

Urban storm water contains many heavy metals and nutrients, which can be treated by bioretention basins. This treatment option is effective in the removal of certain pollutants, such as nitrogen and phosphorus. This field study

provides information on the percent removal of heavy metals and nutrients from eight different plant species, including Pycnanthemum Virginianum, Pycnanthemum Muticum, Rudbeckia Hirta, Rudbeckia Fulgita, Calamagrostis Canadensis, Calamagrostis X Acutiflora, Carex Stricta, and Carex Muskingumensis. The goal of this study is to evaluate specific plant species and their potential for utilization in bioretention systems by observing the amount of contaminants they are capable to filtrate and capture. The field study is conducted at a bioretention basin, where the eight plant species are studied. The goal of this study was to determine and evaluate the contaminant uptake by each plant species by taking plant tissue samples monthly and analyzing the total accumulation of nitrogen, phosphorous, potassium, calcium, magnesium, zinc, manganese, iron, aluminum, and heavy metals. Five areas were designated at the site, each containing nine of each of the plant species (totaling 72 plants per area, and 360 plants total). The five areas were positioned in the bioretention basin to create an even flow and to also allow an equal amount of water to move through each plant species. Further research will include a column study, where synthetic storm water, containing common contaminants from roadways, will pass through plant root systems and engineered soils (bioretention site soil) to evaluate the uptake of selected contaminants.

EFFECTS OF SINO ENZYMES ON WET MILLING CORN STARCH PRODUCTION

Pat Sheridan, Lisa Moncznik
Home Institution(s): Michigan State University
Category: Biosystems and Agricultural Engineering, Section 2
Poster Number: 40
Time: 10:45 AM - 12:00 PM
Mentor(s): Yan Liu (Biosystems and Agricultural Engineering), Wei Liao (Biosystems and Agricultural Engineering), Zhenua Ruan (Biosystems and Agricultural Engineering), Zhiguo Liu (Biosystems and Agricultural Engineering), Xiaoqing Wang (Biosystems and Agricultural Engineering)

The objective of this project is to evaluate the application potential of Sino-enzymes in terms of enhancing the starch production in corn wet-milling process. The enzymes were first characterized according to their molecular weights, enzyme activities and protein contents, and the optimal pH and temperature of the enzymes were determined as well. The enzymes were then applied to batchwise corn steeping process under the optimal enzyme condition. The enzyme samples were compared to a control sample, containing no enzymes, for total starch yield and quality of the batchwise corn steeping method. The enzymes' potential to reduce overall steeping time was also evaluated.

Chemical Engineering and Materials Science

Poster Presentations

OPTIMIZATION OF TIN-DOPED INDIUM OXIDE FOR USE IN TRANSPARENT SOLAR CELLS
Crystal Alton
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster Number: 45
Time: 9:15-10:30 AM
Mentor(s): Richard Lunt (Chemical Engineering and Materials Science)

Building-integrated photovoltaic (PV) technologies are an enticing energy pathway to capturing large areas of solar energy and increasing US building efficiency at the point of utilization. We are currently developing an additive, transparent, molecular photovoltaic that can retain the high glass visible-transparency, while absorbing ultra-violet and near-infrared light for power generation that can allow for optimization of overall transparency and efficiency. An important design aspect of the transparent solar cell is the use of transparent conducting contacts.

DESIGN AND ENGINEERING OF NOVEL AMIDASE ENZYMES
Matthew Bienick
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster Number: 46
Time: 9:15-10:30 AM
Mentor(s): Timothy Whitehead (Chemical Engineering and Materials Science)

Biofuels are a promising source of energy as the cost of oil keeps rising. At the moment biofuels are more expensive to refine than oil because most of the biomass energy is in the form of cellulose and hemicellulose. These sugars, which give plants their rigid structure, are hard to breakdown and then ferment into biofuels. Dr. Dale, of Michigan State University, has come up with a process called ammonia fiber expansion (AFEX). This method pretreats biomass with ammonia, making it easier to break down cellulose and hemicellulose. Amidases are enzymes that biologically convert amides into ammonia and carboxylic acid. The host cell can then use the free ammonia to help breakdown biomass more easily. The goal of the project is to develop kinetic and growth parameters of existing amidases. Once these parameters have been established, we will be able to design and select for better functioning amidases. This selection will then allows us to design better amidase enzymes using protein design software. These newly engineered amidases will be able to produce higher yields of ammonia and carboxylic acid needed for the production of various biomasses.

CELLULOSE CRYSTALLINITY PHENOMENA PERTAINING TO ENZYMATIC HYDROLYSIS
Thomas Birkett
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster Number: 47
Time: 9:15-10:30 AM
Mentor(s): Venkatesh Balan (Chemical Engineering and Materials Science)

Fossil fuels have been the main source of energy for human civilization since the 19th century. However, their finite nature and detrimental effect to the environment necessitate the establishment of renewable and more environmentally friendly sources of energy. One possible source of alternative energy is the burning of biofuels, specifically ethanol, formed from lingo-cellulosic biomass such as corn stover, switchgrass, and even woody plants such as pine or bamboo. A large step in the ethanol production process is the hydrolysis of cellulose into the

simple sugar glucose, which is in turn metabolized by microbes into ethanol. The crystallinity of the cellulose greatly affects the ease with which it is hydrolyzed by cellulolytic enzymes. A simple pre-treatment process allows the natural form of cellulose, cellulose I, to be transformed into cellulose III, a much more easily hydrolyzed form of cellulose. The ease with which cellulolytic enzymes can break down cellulose III allows for reducing the enzyme loading without negatively affecting the conversion of cellulose to glucose. The exact reason behind the high conversion of cellulose III hydrolysis compared to cellulose I is not yet entirely understood. Several factors may affect the susceptibility of cellulose III to improved enzymatic hydrolysis, these include; easier substrate suspension in water and reduced non-productive binding of enzymes to the substrate. Both these factors are currently being investigated.

REDUCTION OF ESCHERICHIA COLI KO11 AND SACCHAROMYCES CEREVISIAE YB 4710 INHIBITION BY HYDROXYCINNAMIC ACIDS DERIVED FROM BIOMASS

Carlos Rafael Castillo Saldarriaga, Fernando Peregrino Cordoba, Kyle Tomek
Home Institution(s): Universidad Nacional de Colombia, Universidad Nacional de Colombia, Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster Number: 48
Time: 9:15-10:30 AM
Mentor(s): Timothy Whitehead (Chemical Engineering and Material Science), David Hodge (Chemical Engineering and Material Science)

Second generation biofuels involve the production of bioethanol from lignocellulosic biomass. Three main steps have to be done to transform biomass into ethanol: (1) pretreatment, (2) enzymatic hydrolysis and (3) fermentation. Pretreatment is needed to make polysaccharides accessible for enzymatic hydrolysis and subsequent fermentation. A number of pretreatment technologies have been developed using diverse range of pH, temperatures, oxidants and solvents. All of those pretreatments have unique positive attributes but they all have a common problem, the generation of inhibitors components from lignin degradation like hydroxycinamic acids. In this summer project the improvement of tolerance of E. coli KO11 and S. cerevisiae BY 4710 to these inhibitor components is addressed. For this purpose, M9 media with different concentrations of ferulic acid, p-coumaric acid and their derived compounds were prepared and the tolerance of E. coli KO11 and S. cerevisiae BY 4710 were tested. Also the removal of these inhibitors compounds using solvent extraction including alkanes and higher alcohols during cell growing and fermentation were carried out as a complement to improve the both strains tolerance. After finding conditions in which the decarboxylase derivatives of these hydroxycinnamic acids are less toxic, enzyme purification and design will be used to improve the catalytic conversion of these acids to their derivatives.

SOLID STATE ELECTROLYTES FOR ADVANCED ELECTROCHEMICAL ENERGY STORAGE

Camila Cendra
Home Institution(s): Technical University of Madrid
Category: Chemical Engineering and Materials Science, Section 1
Poster Number: 49
Time: 9:15-10:30 AM
Mentor(s): Jeff Sakamoto (Chemical Engineering and Materials Science), Ezhiylmurugan Rangasamy (Chemical Engineering and Materials Science)

Energy storage systems today are of the utmost importance. Future generation lithium-ion batteries based on high voltage cathodes require improved electrolytes. Pursuit on stable and incombustible solid non-aqueous electrolytes is one of the key features needed for the implementation of lithium-ion batteries in applications such as hybrid vehicles or grid level electrical storage of renewable sources. The cubic Al-doped Li7La3Zr2O12 (LLZO) garnet is a fast lithium-ion conductor which presents a high stability against metallic lithium, making it a promising membrane for new lithium batteries. In this work, we intend to study and quantify the Lithium transport across this electrolyte as a function of processing conditions to evaluate its potential use in advanced energy storage technology.

SCREENING ALDEHYDES FOR BIOFUELS PRODUCTION
Steven Rausch
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster Number: 50
Time: 10:45 AM - 12:00 PM
Mentor(s): Timothy Whitehead (Chemical Engineering and Materials Science)

One method of achieving energy independence is through microbial conversion of sugars from biomass to chemical products. These chemicals, created from a plant-based source, are to take the place of petroleum derived products. To use a biomass, sugars are liberated from plants by microbes through a fermentation process. The microbes turn the sugars into a variety of products. Common precursors to final products are aldehydes. For the engineering of enzymes to produce aldehydes from sugars, a rapid screening process is needed. When a gene is mutated the microbe carries a slightly different aldehyde-forming enzyme; the rapid screening process will allow a researcher to find which mutations make the enzyme better and which are detrimental to the enzyme. To find and evaluate the different colorimetric and fluorometric dyes is the goal of this project, many of these dyes proved ineffective as a screening process because the dye's range of detection is too high. An effective screening process must have a relatively low range of detection. Another possible avenue for the project is to investigate uses of coupled enzyme assays that track the depletion of NADH. This assay would look at absorbance of 340 nm in the reaction mix to determine the concentration of the NADH. Once perfected the screening process should be able to screens 100s of different variations of an enzyme at a time. In this way the best variation of an enzyme can be found.

SURFACE PROPERTIES OF NON-PRECIOUS OXYGEN REDUCTION CATALYSTS
Edward Schleusener
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster Number: 51
Time: 10:45 AM - 12:00 PM
Mentor(s): Scott Calabrese Barton (Chemical Engineering and Materials Science)

This study focuses on an oxygen reduction catalyst for proton exchange membrane fuel cells composed of nitrogen, iron, and carbon. Although platinum is known to be an effective catalyst for oxygen reduction in a fuel cell environment, its high cost has encouraged research into low cost alternatives. While the non-precious metal catalyst is active for oxygen reduction, the specific composition of the active sites is still uncertain. Activity on the order of precious-metal catalysts requires further understanding and optimization of the catalyst, thus the acid/base properties of the catalyst surface are investigated. Catalyst samples were made with varying nitrogen content, and tested for activity. These samples were then placed in solutions of varying pH, and the change in pH for each was recorded. Data collected in this way were used to calculate both the average basic site strength and quantity of basic sites and then correlated to catalyst activity.

OPTIMIZATION OF NANOPARTICLE SIZE AND SURFACE AREA IN SOLID OXIDE FUEL CELL NANO-COMPOSITE CATHODES
Peter Su
Home Institution(s): University of Michigan, Ann Arbor
Category: Chemical Engineering and Materials Science, Section 4
Poster Number: 52
Time: 10:45 AM - 12:00 PM
Mentor(s): Jason Nicholas (Chemical Engineering and Materials Science)

In the next 30 years, world energy demand is projected to increase 50% [1]. Solid Oxide Fuel Cells (SOFCs) promise to provide this energy in an environmentally friendly manner by efficiently converting fuels into electricity and heat (up to ~90% [2]). However, SOFCs are greatly limited by the high polarization resistance of cell components,

especially the cathode. Nano-composite cathodes (NCCs) lower this resistance by pairing mixed ionic-electronic conducting (MIEC) nanoparticles, which provide a large catalytic surface area, with an ionic conducting scaffold, which easily moves oxygen ions to the electrolyte. However, NCC performance is limited by the size and surface area of the nanoparticles, and comprehensive studies on how to increase surface area by decreasing size were not found in the literature. Therefore, the effects of infiltrate processing conditions on nanoparticle size and surface area were studied. NCCs were prepared by screen printing Ce0.9Gd0.1O1.95 (CGO) scaffolds onto a dense CGO electrolyte. Sm0.5Sr0.5CoO3-x (SSC) nitrate solutions with differing molarities and Triton X–100 concentrations were then infiltrated multiple times to achieve the desired infiltrate loading level. The infiltrated cathodes were then microwaved, fired at different ramp rates, and/or exposed to different numbers of firings in order to create SSC nanoparticles on the CGO scaffold. Nanoparticle size was determined from scanning electron microscope images of the resulting microstructures. The polarization resistance of the cathodes was then tested using electrical impedance.

ANALYSIS OF DISLOCATION - GRAIN BOUNDARY INTERACTIONS AND HETEROGENEOUS DEFORMATION IN POLYCRYSTALLINE TANTALUM

Scott Sutton
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster Number: 53
Time: 10:45 AM - 12:00 PM
Mentor(s): Thomas Bieler (Chemical Engineering and Materials Science), Martin Crimp (Chemical Engineering and Materials Science)

Improved material design can have far-reaching impacts. For example, stronger metals allow engineers to design aircraft and automobiles with less material; and less material results in a lighter structure which allows for great improvements in energy efficiency. The present work focuses on achieving a fundamental understanding of heterogeneous deformation and damage nucleation in polycrystalline metals. This could allow the development of better processing techniques to eliminate the variability in engineering material performance which limits design. The present study uses electron backscatter diffraction (EBSD) to measure local changes in grain orientation as a polycrystalline tantalum specimen is subjected to incrementally increasing strain. Some relative grain orientations may make grain boundaries more susceptible to damage and are of interest in this study. EBSD data are analyzed to produce inverse pole figure and grain reference orientation deviation maps. Data are subsequently processed with other post processing software to observe evolution of parameters related to slip transfer across grain boundaries which may contribute to damage nucleation mechanisms.

CREATION OF THERMALLY STABLE SILICA AEROGEL MONOLITHS WITH AMBIENT DRYING

Thomas Heuser
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster Number: 54
Time: 9:15-10:30 AM
Mentor(s): Jeff Sakamoto (Chemical Engineering and Materials Science), Travis Thompson

Silica aerogel is an extremely low-density, extremely porous solid made by forming a gel structure, and then removing the liquid trapped in its pores. Silica aerogel, in addition to its low density, has remarkably low thermal conductivity, which makes it useful as an insulator. Typically, making silica aerogel requires a time-consuming supercritical drying process to remove the solvent trapped in its many pores. Discovery of a method of making silica aerogel involving ambient drying would allow for faster and easier production. Using the sol-gel technique, silica aerogel has been made which can be dried at room temperature and pressure in air with only minimal shrinkage. This aerogel, which has been fiber-reinforced, is more mechanically robust than typical aerogels. In addition to fibers, this aerogel contains a number of powders, which are added during the liquid mixing phase before gelation to change the structure of the gel as it forms. This new structure improves not only the mechanical properties of the aerogel, but also its thermal properties. This silica aerogel has been shown to be extremely

thermally stable, enduring temperatures up to 1000°C for as long as four continuous hours with little to no cracking or discoloration. This method seems promising, though some work remains to be done in optimizing the process, particularly in ensuring that the fibers and powders added do not compromise the gel's low density or low thermal conductivity.

THE PRODUCTION AND REENGINEERING OF BRAIN DERIVED NEUROTROPHIC FACTOR

Rebecca Jacobs
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster Number: 55
Time: 9:15-10:30 AM
Mentor(s): S. Patrick Walton (Chemical Engineering and Materials Science), Phil Angart (Chemical Engineering and Materials Science)

Brain Derived Neurotrophic Factor, more commonly referred to as BDNF, is a growth factor found in the central and peripheral nervous systems. Among its many purposes, BDNF is used to promote axonal growth. On a related note, a hydrocarbon scaffold is being developed which can guide axonal growth in the peripheral nervous system. Essentially, this scaffold can help repair nerve damage in certain areas of the human body. BDNF is needed in this scaffold to encourage axons to grow and reconnect, and as a result, it is being integrated into the scaffold. However, little is known about the production of BDNF. The first step of this project is to successfully produce functional BDNF using E.coli. Furthermore, BDNF is not completely compatible with the scaffold. It is stable at a higher pH range than that which the scaffold is originally created at. Consequently, BDNF needs to be manipulated so it can withstand the same conditions as the scaffold. The main focus of this project is to reengineer BDNF so it is functional and stable at a lower pH range.

IMPROVING THE PERFORMANCE OF THE PHOTON DETECTION SYSTEM IN THE BECOLA FACILITY

Benjamin Johnson
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster Number: 56
Time: 9:15-10:30 AM
Mentor(s): Paul Mantica (Chemistry), Kei Minamisono (NSCL), Andrew Klose (NSCL), Anthony Schneider (NSCL)

The BEam COoler and LAser Spectroscopy (BECOLA) facility [1] has been developed at the National Superconducting Cyclotron Laboratory, for the purpose of performing collinear laser spectroscopy upon atoms and ions to determine their hyperfine structures. Presently, an offline ion source is used to generate an ion beam, which may be passed through a charge exchange cell to produce an atom beam [2]. The ion/atom beam is then collinearly propagated with laser light [3], and fluorescence is measured in a photon detection system [2]. The photon detection system can be configured to detect transitions in the near-UV (350-500 nm) or in the near-IR (700-1000 nm) wavelength ranges. In either configuration, the ion/atom beam and laser pass through one focal point of an ellipsoidal reflector. The laser-induced fluorescence is reflected to the other focal point, normal to the beam axis [2]. A photomultiplier tube (PMT) converts the photon count to an electrical current [4]; two PMTs are used, depending on the wavelength range. While the near-UV PMT is able to detect fluorescence at the second focus of the reflector, the geometry of the near-IR PMT requires a more remote placement and a photon transport device [2]. Several metallic reflector tubes and a hexagonal glass light guide have been examined and tested for their efficiency in transporting light. The results of these tests, meant to determine reflectivity and efficiency relative to the wavelength and angle of incident photons, will be presented. A comparison between the experimental and simulated data will also be presented.

A SELECTION ALGORITHM FOR THE EFFECTIVENESS OF ASYMMETRIC SIRNAS
Sean Kappes
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster Number: 57
Time: 9:15-10:30 AM
Mentor(s): S. Patrick Walton (Chemical Engineering and Materials Science), Amanda Malefyt (Chemical Engineering and Materials Science)

Genes are expressed when ribosomes translate messenger RNAs into proteins. Since these proteins are not always wanted, short interfering RNAs (siRNAs) can be used to prevent translation of these mRNAs by the ribosome, thus "silencing" the gene. While finding sequences that can cause silencing is not very difficult, where the siRNAs bind to the mRNA, can greatly affect the efficiency of the silencing observed in the cell. When the double-stranded siRNA is injected into the cell, one strand will be chosen, and the other will be discarded. If there is not an even split in which strand is used and which is not, the siRNA is referred to as "asymmetric," as one strand is preferentially selected over the other. This experiment is meant to determine the accuracy of a newly designed algorithm for predicting the activity of various siRNAs designed to target two different mRNA sequences based on two characteristics of asymmetry, the 5' end sequences of the siRNA strands and the relative thermodynamic stabilities of the ends.

CHARACTERIZATION OF DELIGNIFICATION AND SACCHARIFICATION FOR WOOD CHIPS BY TREATING BIOMIMETIC OXIDATION: COPPER(II)-2,2'-BIPYRIDYL AND IRON(III)-PROTOPORPHYRIN IX
Charles Chen
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 5
Poster Number: 58
Time: 10:45 AM - 12:00 PM
Mentor(s): David Hodge (Chemical Engineering and Material Science)

Depolymerization of lignin in lignocellulosic biomass to optimize the enzymatic hydrolysis and increase the sugar products is an important step of biorefinery processes in industry. Catalyzed oxidative pretreatment is a useful method in removing the lignin to improve enzymatic accessibility for hydrolysis, and this method is more likely as the mechanisms of laccase and lignin-peroxidase. Laccase and lignin-peroxidase are oxidoreductases which containing each copper-ligands and iron-prophyrin in the activity center site, respectively. The metal-catalysts require electron donors like hydrogen peroxide, so the catalysts lead the hydrogen peroxide transform to oxygen radicals. The radicals then do hemolytic or heterolytic cleavage of side-chains (Cα-Cβ, alkyl-phenyl) and aromatic rings (aromatic-pi bonds) on lignin to give degradation products. The degraded lignin enhances the accessibility of polysaccharides to cellulase and hemicellulase enzymes, and reducing sugars are recovered after the saccharification. The separation of recovered sugars and oxidized lignin has widely applications in biofuel and biomaterial, and it has strong potential to be a key step in liberating the lignin without sacrificing polysaccharides in biorefinery processes than other pretreatments (e.g. dilute acid pretreatment).

DILATOMETRY STUDIES OF SURFACE-DOPED YTTRIA STABILIZED ZIRCONIA POWDER
Andrew Flegler
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 5
Poster Number: 59
Time: 10:45 AM - 12:00 PM
Mentor(s): Jason Nicholas (Chemical Engineering and Materials Science), Qing Yang (Chemical Engineering and Materials Science)

Yttria stabilized zirconia (YSZ) is a commonly used high temperature oxygen ion conductor used in solid oxide fuel cells as electrolytes. Dopants may be used to lower the sintering temperature of this ceramic, which is beneficial to

the solid oxide fuel cell electrolyte as long as the dopant does not deteriorate the electrolyte's oxygen ion conductivity or allow an electric current to flow across the electrolyte. In this research, a single batch of 8 mol% Tosoh Yttria Stabilized Zirconia(Y0.16Zr0.84O1.92) was doped with eleven different metals; barium, calcium, cobalt, copper, iron, lithium, magnesium, manganese, nickel, strontium and zinc in 1,3, and 5 mol% quantities. The powder was then pressed into a pellet and tested at a constant heating rate of 5 Celsius/minute from 25 to 1525 Celsius in a dilatometer in air. After the dilatometry, x-ray diffraction, scanning electron microscopy and AC impendence spectrometry was done to test the effects of the dopants on the phase purity, microstructure, and electrical properties of the electrolyte.

QUANTIZED CHARGING OF PVP STABILIZED RUTHENIUM NANO-PARTICLES

Adeline Ford
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 5
Poster Number: 60
Time: 10:45 AM - 12:00 PM
Mentor(s): Robert Ofoli (Chemical Engineering and Materials Science)

Stabilized metallic nanoparticles have many useful properties that are often different from their bulk counterparts. These properties can be tuned for many applications, and are typically strongly dependent on the size and shape of the particles. Both uniformity and monodispersity are important in many applications. One application in which both uniformity and monodispersity are important is in the quantized charging of the nanoparticles and their subsequent use in hydrogen producing systems such as photocatalysis and solar energy conversion. The goal of this project is to determine if Ruthenium nanoparticles that have been stabilized with polyvinylpyrrolidone (PVP) can hold a charge following exposure to sunlight. If this is achievable, it may provide a way to store solar energy in a convenient form that can be used for water splitting to generate hydrogen during times when there is no direct solar energy input into the system. Electrochemical measurements will be performed on the PVP-stabilized Ru nanoparticles, to assess properties such as size, polydispersity and stability on quantized charging efficiency as well as rates of oxygen evolution.

MODELING OF FOAM FLOW FRONTS IN POLYURETHANE FOAMING

Christopher Hershey
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 5
Poster Number: 61
Time: 10:45 AM - 12:00 PM
Mentor(s): Krishnamurthy Jayaraman (Chemical Engineering and Materials Science)

The polyurethane foaming process of a pour is currently being investigated to better model the advancement of the foam flow front. Unlike injection flow molding, foam expansion from a pour is dictated by large changes in volume up to forty-fold as well as an increase in viscosity ratios by orders of magnitude. By using experimental data from a polyurethane foaming apparatus, models of density and viscosity are fitted as functions of time. Density is modeled with a specified expansion factor that controls the rate at which the foam expands. Implementing complex variations of viscosity models as a function of time yield more accurate pressure profiles of the reacting polyurethane. These models are used in numerical simulations calculated by the finite element software FLUENT using user-defined functions (UDF). The volume of fluid (VOF) method is used to track the foam flow front throughout the simulation. The foam flow front of a single pour in an unobstructed region is shown to match the literature using identical specifications.

EFFECT OF PLANARIZATION TEMPERATURE ON SURFACE FORM MEMORY IN NITI SHAPE-MEMORY ALLOYS
Michael Kirin
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster Number: 62
Time: 9:15-10:30 AM
Mentor(s): David Grummon (Chemical Engineering and Materials Science)

Surface Form Memory (SFM), a subset of the shape memory effect, is the reversible transition from one surface form (e.g. bumpy) to another (optically flat), achieved by changing temperature. In particular, indenting martensitic NiTi can produce a two-way shape memory effect: on heating an indent becomes shallower, and on cooling it becomes deeper. To achieve a true SFM effect, we combine indentation with a process termed 'planarization', in which material is removed from the sample down to the base of the indent. Previous experiments focused on 'M-planarization', in which the sample was planarized at T < Mf. This created the SFM effect: 'flat when cool, bumpy when hot'. The present research uses an alternate: 'A-planarization', in which the surface is ground flat at T > Af. This achieves the SFM effect: 'indented when cool, flat when hot.' In either case, subsurface deformation zones support robust SFM. Applications for SFM engineered surfaces may include tribological interfaces, microelectromechanical devices, and mechanical coupling.

EFFECTIVENESS OF SILICA NANOPARTICLES FOR USE IN SIRNA DELIVERY
Stephen Lindeman
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster Number: 63
Time: 9:15-10:30 AM
Mentor(s): S. Patrick Walton (Chemical Engineering and Materials Science), Amanda Malefyt (Chemical Engineering and Materials Science)

Since the discovery of RNA interference (RNAi) in 1998, the use of short interfering RNA (siRNA) for therapeutic development has been on the rise. RNAi utilizes sequence specific siRNA to inhibit the production of a target protein by a natural cellular pathway of messenger RNA (mRNA) degradation. Gene silencing results from this process, as the protein previously expressed through translation of the mRNA sequence can no longer be produced. In order for siRNAs to have realistic applications in human gene therapeutics, effective ways of transporting these easily degraded molecules through the body and into desired cells must be found. One prospect for such a "vehicle" is silica nanoparticles (NPs), which serve as a structure to bind and protect siRNAs until they safely enter the targeted cells. In the present study, silica NPs were functionalized with various amine and dextran constituents in order to increase binding affinity to siRNA, as well as to improve the eventual silencing efficiency of their siRNA cargo.

SELECTIVE HYDROGENATION OF CINNAMALDEHYDE USING RUTHENIUM NANOPARTICLES IN BATCH AND MICROFLUIDIC REACTORS.
Tim Magee
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster Number: 64
Time: 9:15-10:30 AM
Mentor(s): Robert Ofoli (Chemical Engineering and Materials Science)

The selective hydrogenation of unsaturated aldehydes is an important step in the synthesis of many fine chemicals such as pharmaceuticals intermediates and food additives. Ideally, we would like to design a catalyst that could selectively promote a certain reaction pathway, whether it be C=C or C=O bond reduction. We are currently making Ruthenium nanocatalysts with well-defined structures, in order to study their catalytic properties in both batch and microfluidic reactors. The nanoparticles were synthesized by polyol reduction. After synthesis, they

were characterized and then tested in both batch and microfluidic reactors using cinnamaldehyde as the substrate. In the batch reactor, the particles were added to the reactor and then pre-reduced before the cinnamaldehyde was added. The reactor was then run at different temperatures and concentrations. In addition to the batch reactor system, the Ruthenium catalysts were immobilized in capillary reactors to evaluate cinnamaldehyde hydrogenation in a flow system. The capillary was thoroughly cleaned, and the surface hydrolyzed by HCl and H2O2, followed by aminosilanization. The capillary was then filled with a Ru nanoparticle solution overnight, dried and cured in an oven to complete catalyst immobilization. The capillary was pre-reduced with hydrogen before the reaction was conducted over a range of temperatures, substrate concentrations and flow rates. In the flow system, Ru seemed to favor C=C bond reduction, while in the batch system C=O bond reduction was favored. The reasons for this difference are currently under investigation.

DETECTION OF NITRATE IN GROUNDWATER SUPPLIES USING A HIGHLY SENSITIVE NANOSTRUCTURED ELECTROPOLYMERIZED PEDOT BIOSENSOR

Nathan Parker
Home Institution(s): Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster Number: 65
Time: 9:15-10:30 AM
Mentor(s): Lee Ilsoon (Chemical Engineering and Material Science), Ankush Gohkale (Chemical Engineering and Material Science)

In recent years, there has been a steady rise in the release of nitrate, a highly water soluble contaminant into the environment. Fertilizer runoff from agricultural lands is a major source of nitrate contamination. The deleterious effect of excess nitrate on plant and animal life is well-documented. In humans, nitrate and its metabolites are known to block oxygen from binding with hemoglobin resulting in severe health conditions such as methemoglobinemia. Development of easy to use, mobile, and responsive methods to detect nitrate concentration in drinking water would help minimize heath risks associated with excess nitrate consumption. In our work we propose a nanostructured enzymatic biosensor that detects nitrates in water using the enzyme nitrate reductase. The enzymatic conversion of nitrate to nitrite under anaerobic conditions produces tiny fluctuations in electron flow which can be monitored by measuring the change in the current. The enzyme is immobilized on the surface of poly(3,4-ethylenedioxythiophene) (PEDOT), a conductive polymer known for its chemical stability. PEDOT nanowires and nanotubes are grown in alumina membrane using a templated electrochemical polymerization approach. The effects of electron mediators, in this case methyl viologen, on sensor sensitivity and response time are also investigated. All electrochemical measurements are made using a CH instruments-model 650 A workstation using the conventional three electrode system.

Civil and Environmental Engineering

Poster Presentations

THE LIVING ROOF: UNDERSTANDING STORM WATER MANAGEMENT AND INSULATING PROPERTIES OF GREEN ROOFS

Laura Bailey
Home Institution(s): Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster Number: 70
Time: 10:45 AM - 12:00 PM
Mentor(s): Milind Khire (Civil and Environmental Engineering), Indrek Wichman (Mechanical Engineering)

Urbanization has been adversely impacting the natural environment. Green roof technology has the potential to mitigate environmental degradation in urban areas. Benefits from green roofs include: energy efficiency, storm water management, attenuation of pollutants, aesthetics, and carbon sequestration. The key objective of this project is to use the water balance model UNSAT-H, which is typically used for the design of evapotranspirative landfill covers, to simulate the storm water runoff collected from three instrumented green roofs located in Traverse City, Michigan. Current design practice of green roofs is empirical. Hence, a validated numerical approach will provide a robust tool to design green roofs and determine the effectiveness of green roofs in storm water management. Reduction in run-off will decrease the amount of water going into municipal treatment facilities and the green roof will to some extent attenuate atmospheric pollutants. In addition, green roofs are known to reduce the heat flux through a building because the growing media acts as an insulation layer. Using this information, the project tested soil used in the growing media from the test green roofs in Traverse City to quantify the heat loss or gain. The instrumentation that we used heated the soil sample and measured the transference of heat through soil to determine the thermal conductivity. The potential cost savings from the reduced energy usage can be calculated using these results.

FATIGUE CRACKING PERFORMANCE OF CRUMB RUBBER MODIFIED ASPHALT MIXTURES

Ernest Schenk
Home Institution(s): Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster Number: 71
Time: 10:45 AM - 12:00 PM
Mentor(s): Emin Kutay (Civil and Environmental Engineering)

A major problem with asphalt pavements is the fatigue cracking that occurs along wheel path at moderate temperatures, mainly caused by repeated heavy traffic load. Crumb rubber (CR), a form of recycled shredded tire, has recently been used in hot mix asphalt (HMA) roads to help reduce fatigue cracking. The CR modified asphalt mixtures help reduce cracking due to their elastic properties, which makes the pavement more flexible (less brittle). In addition, the anti-oxidants that already exist in CR mixes well with asphalt, making asphalt less prone to oxidation, i.e., aging and embrittlement. The objective of this study was to investigate fatigue cracking performance of a specific CR modification method called Wet Process using different aggregate gradations and mix designs. In the laboratory, the relative fatigue cracking performance of three mixes (a control mix, a crumb rubber wet mix of fine aggregate, and a crumb rubber wet mix of coarse aggregate) were tested using the Dynamic Modulus Test for five temperatures at six frequencies,. In addition, the Push-Pull Fatigue Test was also carried out on the same three mixtures at two temperatures (20°C and 15°C) with a frequency of 10 Hz. The test data was analyzed using the Viscoelastic Continuum Damage (VECD) Theory. The primary advantage of VECD-based analysis is that, once the model is calibrated, performance of the HMA at a variety of temperatures and loading rates can accurately be predicted.

DNA PRIMER DIFFUSION CONTROLLED BY POLYESTER WAX
Xiyan Wang
Home Institution(s): Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster Number: 72
Time: 10:45 AM - 12:00 PM
Mentor(s): Syed Hashsham (Civil and Environmental Engineering)

The current procedures for genetic analysis are influential, however, they are complicated to use and expensive. Most importantly, diffusion of the primer, cross contamination between wells is a problem. Using Gene-Z, which was created for point of care genetic testing by the Michigan State University Environmental Genomic Lab, we had created a polyester microfluidic chip using DNA primer for isothermal amplification. To address the issue of the cost and simplification of production of the chip, the polyester chip was replaced with a new acrylic chip. This new chip was cut by a laser cutter; it contains four arrays of 16 reaction wells with one long micro-channel to connect them together. Each array has one pair of valves, and when sealed with epoxy, they prevent liquid from exiting the chip during dispensing. Adding liquefied polyester wax in every other reaction well in a column prevented the ongoing problem of DNA primer diffusion after it was placed and dried. After the polyester wax solidified in the reaction wells, it locked in the DNA primer while reaction mixture was injected to avoid movement of the primer when the acrylic chip was heated. With the success of using polyester wax to prevent primer diffusion, a high-density acrylic chip with a total of 384 reaction wells that only has one pair of valves will serve as feasible replacement to the polyester chip. Along with the simplicity and low cost of the new acrylic chip, this development will streamline future genetic analysis using the Gene-Z device.

EFFICIENCY OF ULTRAVIOLET CATALYTIC PARTICLES
Adam Wingate
Home Institution(s): Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster Number: 73
Time: 10:45 AM - 12:00 PM
Mentor(s): Vlad Tarabara (Civil and Environmental Engineering)

Membrane separation processes offer an efficient way to purify water and eliminate potentially harmful pathogens. However, under certain conditions smaller particles such as viruses may be able to pass through membranes. To ensure complete removal of viruses, membrane filtration can be coupled with a disinfection process. To improve the efficiency of disinfection and make such coupling synergistic, membrane surfaces can be modified with photocatalytic nanoparticles. To choose the most appropriate photocatalyst, one needs to screen a number of candidate materials. An inexpensive screening approach involves monitoring the catalytic production of hydroxide radicals OH* using salicylic acid as an OH* probe. The goal of my project is to design a batch UV apparatus suitable for rapid and quantitative characterization of the catalytic activity of several nanoparticles. The project involves several steps: 1) 50 ml samples of a 0.1 M iodate and 0.6 M iodide actinometric solution are irradiated under UV-C light. The distance between the light source and solution is varied in order to estimate fluence as a function of distance. 2) Using this information, the UV batch apparatus is built with a possibility of controlling the UV fluence. 3) Finally, the different catalysts are irradiated in a solution containing salicylic acid. The catalysts react with UV light to produce OH radicals which subsequently react with the salicylic acid in a number of reactions and side reactions. By monitoring the rate at which these reactions occurred, the production of OH radicals—and therefore the efficiency of each catalytic particle—is determined.

Computer Science and Electrical Engineering

Oral Presentations

PROTOTYPE OF ROBOTIC FISH
Zain Bhatti
Home Institution(s): North Carolina A&T State Univerisity
Category: Computer Science and Electrical Engineering, Section 1
Location: 1234 EB, 9:15 AM
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

The purpose of the project is to use 3D printer for fast prototyping robotic fish. The robotic fish technology will allow people to sense pollution within water. Water pollution is a long term cause which leads to disease and death, and this issue still persists worldwide. Previous methods of monitoring water quality include manual sampling and ship-based sampling, which are labor-intensive with difficulty in getting continuous and pervasive measurement. Robotic fish will make the water sampling more efficient and effective. The applications of this technology include water quality monitoirng, tracing oil spills and patrolling harbors and coasts. My project aims to use computer software known as Solidworks for designing fish shells, which are then prototyped with a 3D printer. The design will provide an ability to open or close a upper lid (while keeping it waterproof), which will allow anyone to upgrade or change the parts within a fish easily. Previous generations of robotic fish tend to be sealed with silicone, which causes an issue when one tries to upgrade or fix a part of a fish. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

SOFTWARE DESIGN FOR GRAPHICAL USER INTERFACE OF ROBOTIC FISH SYSTEMS
Juan L. Castro-García
Home Institution(s): University of Puerto Rico, Bayamón Campus
Category: Computer Science and Electrical Engineering, Section 1
Location: 1234 EB, 9:30 AM
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

This project is to develop a Graphical User Interface (GUI) between a computer and a robotic fish system that helps the user understand data from the robotic fish as well as send commands to the robot. This system will gather various water quality data of aquatic environments through sensor modules installed in the fish. The fish will send data to the computer using a Zigbee wireless communication module. This software will display this data following a protocol that specifies the sender module and the data sent. The application will control the fish's movement and actions through a keyboard, joystick, and other devices. The C# programming language will be used for the implementation of this software. This interface will facilitate the analysis of data from the robotic fish. Future research would allow the control and data gathering from multiple robotic fish. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

PLAYING A NAMING GAME WITH DARWIN: TOWARDS HUMAN-ROBOT DIALOG
Kenneth Hanson
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 1
Location: 1234 EB, 9:45 AM
Mentor(s): Joyce Chai (Computer Science and Engineering)

Despite advances in many areas of robotics and natural language processing, to date most robots designed for human interaction are not able to engage in natural spoken communication. Our research aims to develop technology to enable situated human-robot dialog, where robots and humans to accomplish joint tasks through spoken interaction. Our current work focuses on new strategies of referential grounding and dialog management.

We are studying how humans make reference to the environment when they have a mismatched perceptual basis, using these findings to develop algorithms that will allow robots to effectively mediate a shared perceptual basis with their human partners. We are currently implementing these algorithms in a DARwIn-OP humanoid robot, and evaluating the robot's capabilities in a naming game with a human partner.

AIDING MANUAL IMAGE ANNOTATION USING A KINEMATIC MODEL
Jassiem Ifill
Home Institution(s): Morehouse College
Category: Computer Science and Electrical Engineering, Section 1
Location: 1234 EB, 10:00 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

This study seeks to develop computational tools to assist biologists in conducting their research. For example, we are working with biologists who are studying the way chameleons move by observing videos of them walking on a straight horizontal pole. To analyze these chameleon videos, these biologists use software called "ChamView." The ChamView software helps scientists annotate images and videos to keep track of where the chameleons eyes, limbs, and other important body parts are as they move along the pole. Using this software the biologists measure interesting points in different chameleon videos to help develop, propose and test hypotheses about how chameleons have evolved their ability to navigate. However, manual image annotation requires a lot of tedious, time-consuming work by the scientists sitting at computers in their office. The ChamView software is being updated to integrate simple point predictors as part of the annotation process. These predictors need not always be correct, but they should help reduce the amount of time the biologist needs to click on points. Specifically, this study will create a kinematic model, which will use three points that the scientists pick to attempt to predict the next point for the scientist. If the kinematic prediction is correct the scientist will simply be able to press next for each frame until an error occurs and the point needs to be corrected (instead of manually clicking points in every frame). The Kinematic predictor is being integrated with other prediction models being developed by our team. The goal is to make a complete system that works in many scientific domains and makes image annotation faster and research easier. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

AUTOMATED IMAGE MEASUREMENTS
Shiloh Jordan
Home Institution(s): University of Maryland, Baltimore County
Category: Computer Science and Electrical Engineering, Section 1
Location: 1234 EB, 10:15 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

This study seeks to develop a new computational method to measure the shape of the Drosophila fly (fruit fly) wing in order to understand evolution and genome sequences. Additional work looks at the correlation between wing shape and genome sequence to understand how to the fly evolves. The problem arises in how to properly measure the fly wing. Currently WingMachine is used to measure the shape of the insect's wings. One problem with WingMachine is that it requires human input of specific points for each image. This task becomes really difficult when researchers need to select points on tens of thousands of images. In addition to scaling problems, human input can be prone to its own error (human error) and there may be unpredictable bias in the measurements taken by WingMachine. We hypothesize that there is an easier and more efficient way to measure a Drosophila fly's wing. We have created a program (written in Python) to automatically measure its shape in an effort to remove human error and reduce the chance of overlooking important information. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

APPLYING DIGITAL NORMALIZATION TO TRANSCRIPTOME SEQUENCING: SENSITIVITY AND SPECIFICITY IN ISOFORM RECOVERY

Danny Lynch
Home Institution(s): University of the Virgin Islands
Category: Computer Science and Electrical Engineering, Section 2
Location: 1234 EB, 10:45 AM
Mentor(s): C. Titus Brown (Computer Science and Engineering)

Advances in next generation sequencing (NGS) have led to a wealth of data being produced by the scientific community. These large data sets require new software and pipelines to lower the cost of de novo transcriptome assembly. Digital normalization, a single pass algorithm, that reduces the size of shotgun sequence data sets, is one such tool. The purpose of this study was to determine if digital normalization could be effectively used to reduce RNA-Seq data sets while retaining sufficient information for assembly of alternative splice variants. Using a yeast reference transcriptome and a known RNA-Seq read set, we digitally normalized the read set at a range of coverage levels and mapped the results. We then assembled the original and normalized read sets and compared the resulting transcriptome assemblies with the reference. It is expected that at the varying coverage values, more splice variants will be retained, and digital normalization will result in transcriptome assemblies that are comparable to the assembly using original data. By more efficiently processing RNA-Seq data using digital normalization, it will be possible to assemble complete transcriptomes in a fraction of the current time.This increased knowledge will facilitate greater understanding of gene expression and function. Eventually, this could help improve direct patient care and future biomedical research endeavors. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

A MAXWELL-BLOCH SOLVER FOR THE ANALYSIS OF NANOCAVITY OPTICS PROBLEMS

Nicholas Miller
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 2
Location: 1234 EB, 11:00 AM
Mentor(s): Shanker Balasubramaniam (Electrical and Computer Engineering)

The Maxwell-Bloch equations govern the behavior of quantum mechanical systems coupled to electromagnetic fields. These equations are used in the modeling of numerous phenomena, ranging from established practical technologies, such as Nuclear Magnetic Resonance (NMR), to systems that are more the province of fundamental science, such as those used in nanocavity optics. In a typical nanocavity optics experiment, electromagnetic energy is coupled into the modes of a small cavity resonator, that is then exchanged with the quanta of a reduced dimensional system such as excitons in a quantum dot. Developing an understanding of the control of these systems is relevant to a number of potential applications in quantum information. Otherwise, understanding cavity mediated energy transfer between multiple quantum systems is pertinent to the analysis of devices that harvest or generate light such as solar cells or LEDs and lasers. Much of the theoretical analysis on these systems has been performed using perturbations on canonical geometries that are semi-analytically soluble. To aid in the transition of some of these systems into engineering applications, we are presently developing codes that can accurately solve the Maxwell-Bloch system on experimentally relevant non-canonical geometries. In particular, we will present a fully integrated solver that accurately and self-consistently solves these equations within a Nodal Discontinuous Galerkin framework. We intend to examine the role that using non-canonical structures plays in optimizing the coupling between the cavity modes and the dot.

DESIGNING OF ELECTRONICALLY TUNABLE MIRROR FOR MICROWAVE TOMOGRAPHY

Tarun Mishra, Amin Tayebi
Home Institution(s): Indian Institute of Technology, Michigan State University
Category: Computer Science and Electrical Engineering, Section 2
Location: 1234 EB, 11:15 AM
Mentor(s): Lalita Udpa (Electrical and Computer Engineering), Satish Udpa (Electrical and Computer Engineerig)

Active microwave imaging techniques have been proposed as a promising complementary imaging modality for structural (e.g., evaluation of composite aircraft parts) and medical (e.g., tumor detection) imaging. The work involves the design and fabrication of an electronically tunable reflect array (mirror) prototype for microwave tomography system for the noninvasive characterization. In conventional microwave tomography systems, the object undergoing diagnosis is illuminated by a source at different angles/positions and the measured fields are used to iteratively reconstruct the material property. The proposed technique utilizes a single fixed transmitter antenna and a continuously electronically tunable mirror with reflective coating to steer the incident electromagnetic waves for multi-view field measurements. The electronically tunable mirror in the proposed system steers the incident field for multi-view illumination, without the need for antenna switching and compensation. This is attained by varying the impedance of each of the cells in the reflect array in a controlled manner through electronic switching using varactor diodes. An inheret benefit of the proposed system is the ability to focus the RF waves on the biological tissue to destroy the cancerous cells selectively as part of an adjuvant or ablation therapy protocol. It can also function as an adaptive focusing mirror to deliver energy at the tumor site to elevate its temperature. Preliminary results obtained using model simulations for the proposed electronically tunable mirror based microwave imaging and therapy system show its viability for dielectric material imaging.

THE VARIATION OF ACCURACY AND PRECISION IN GROUND TRUTH POINTS

Brea Myers
Home Institution(s): Spelman College
Category: Computer Science and Electrical Engineering, Section 2
Location: 1234 EB, 11:30 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

This study seeks to make the science software that interacts with images of human faces better. Face images are commonly used for security purposes, but can also be used in human user interfaces and a variety of gaming systems. Many applications that use faces require accurate detection of anchor points (landmarks) such as the tip of the nose or the corner of the eyes. Although there are many existing approaches to anchor point detection on the face, there is no easy way to evaluate the success of these approaches in terms of point accuracy and precision. Traditionally the method for evaluating accuracy and precision of anchor points is to have someone manually select ground truth points. However, ground truth points selected by hand are prone to human error and may vary greatly between different people. We are developing a new computational method based on 3D face information that should improve the evaluation of anchor point detection algorithms and provide a better baseline for researchers to improve the accuracy and precision of landmarks. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

INVESTIGATION OF THE SENSITIVITY/SPECIFICITY OF DIGITAL NORMALIZATION USING HUMAN MICROBIOME PROJECT METAGENOMIC TEST DATA SETS

Tobias Ortega-Knight
Home Institution(s): University of the Virgin Islands
Category: Computer Science and Electrical Engineering, Section 2
Location: 1234 EB, 11:45 AM
Mentor(s): C. Titus Brown (Computer Science and Engineering, Microbiology and Molecular Genetics), Alexis Black Pyrkosz (USDA Avian Disease and Oncology Laboratory), Adina Howe, (Microbiology and Molecular Genetics, Computer Science and Engineering)

Environmental genomicists are often overwhelmed by the sheer amount of metagenomic sequencing data produced in a single experiment. One computational tool to process this data is digital normalization, a new heuristic approach that reduces sequencing data to a minimum while preserving maximum information content. In this study, we evaluate the sensitivity and specificity of digital normalization on metagenomic data, with the goal of showing that this approach is successful in reducing the volume of data without losing information. First, we map reads before and after digital normalization to reference genomes from the Human Microbiome Project (HMP) mock data sets and compare the coverage of the reference (sensitivity) and accuracy of the mapping (specificity) in both cases. We then perform metagenomic assembly on both the raw and normalized reads and compare the assemblies to the reference to determine those areas where information from the normalized reads is lost and where normalization allows us to retain information that was lost in the raw read set. Our results from the mapping analysis are predicted to show that coverage from the normalized reads is equivalent or improved compared to the raw reads while also maintaining or increasing accuracy. We expect the assembly results to be an improvement of current methodologies. This investigation will contribute to our understanding of the power and limits of current metagenomic assembly approaches.

TESTING THE K VALUE OF DIGITAL NORMALIZATION: HOW MUCH CAN BE ASSEMBLED?

Robert Ray, Jr.
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Location: 3405B EB, 10:45 AM
Mentor(s): C. Titus Brown (Computer Science and Engineering, Microbiology and Molecular Genetics)

In todays scientific community there is rarely a problem that can be solved using a single field of study. For example, medicine is attempting to use genes and gene expression to analyze the caner genome and develop an advanced way to treat cancer. Technology has evolved such that we are able to sequence high volumes of data consistently at a low cost using a technique known as shotgun sequencing. However, until recently it was almost impossible to assemble this data due to lack of memory, revenue, and time. Digital normalization is a single pass algorithm that systemizes the data from shotgun sequencing thus decreasing sampling variation, removing error, and discarding otherwise redundant information. This project aims to optimize digital normalization by varying the size of the k-mer; it has been proven that a k-mer size of 20 produces significantly accurate results with the yeast transcriptome data set. This project will vary the k value and compare results after assembling with the trinity program. Since this has never been done before there are no expected results based on literature, however we do predict that that k values close to twenty should produce very similar results. The goal of this project is to produce a “perfect” from a k-value. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

SUBSAMPLED DATA AND THE TRINITY ASSEMBLER
Gavin Richard
Home Institution(s): Grambling State University
Category: Computer Science and Electrical Engineering, Section 3
Location: 3405B EB, 11:00 AM
Mentor(s): C. Titus Brown (Computer Science and Engineering, Microbiology and Molecular Genetics)

In the field Computer Science there is always a need to find the fastest, cheapest, and most accurate way to process data. Currently digital normalization has all three and is the cutting edge in computational biology research. In this experiment there will be tests run using the Trinity assembler to prove that this program is a great way of reducing data. To prove that digital normalization is an accurate and efficient way of reducing data the input data will be manually sub-sampled and assembled in Trinity. Once the data was assembled it then got compared directly to the results acquired from using digital normalization. We first map the yeast mRNAseq reads to the yeast transcriptome, and plot the distribution of coverage to determine the number of bases in the transcripts that are covered by reads. Following that, the read set was cut in half and assembled in Trinity. Then plotted and compared to the first results. The data was continually cut in half until it is visibly shown on the chart that there are holes in the data. The goal is to see at what coverage sequences are lost to Trinity assembly by systematically subsampling the Trinity data set. It is expected that transcripts with lower coverage will tend to be lost before those with higher coverage due to probability calculations. Thus proving that digital normalization is needed because, although digital normalization reduces data dramatically there are no transcripts lost. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

INTELLIGENT ELECTROCHEMICAL GAS ANALYSIS SYSTEM
Antonio Smith
Home Institution(s): Grambling State University
Category: Computer Science and Electrical Engineering, Section 3
Location: 3405B EB, 11:15 AM
Mentor(s): Andrew Mason (Electrical and Computer Engineering), Haitao Li (Electrical and Computer Engineering)

In spite of continued safety improvements and increased regulations, underground mines remain a very dangerous work environment. The goal of the microsystems lab is to create a device which can monitor various types of measurements such as temperature, humidity, and gases that are found in these underground mines. The device measures all gases that are connected to fires and explosions (CH4, CO, CO2, O2) as well as hazardous exhaust gases (NO, NO2, SO2). The device is structured and functions like a flash drive. This study seeks to develop graphical user interface (GUI). Through the development of GUI, the user will be granted the capabilities of visually monitoring the concentration of the gases, temperature and humidity, and change the system configurations. The iEGAS will be deployed with miners or at fixed locations within a mine for long-term monitoring. It will be inexpensive, ultra compact and lightweight, easily carried by miners and rescue teams. It will utilize a standard interface to communicate with existing mine infrastructure or with wireless mine communication handsets to realize a highly distributed, mobile, multi-gas monitoring network. The sensor board is naturally resistant to vibration, smoke, moisture, and other common mine interferences and sensors will be internally calibrated for variable environmental conditions such as temperature and humidity. An operational model of the proposed iEGAS system will be implemented and characterized in a laboratory where gas concentrations and environmental parameters can be accurately controlled to simulate the range of conditions within underground mines. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

UNDERSTANDING GENE EXPRESSION THROUGH MODELING IN DROSOPHILA MELANOGASTER
Benjamin Taylor
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Location: 3405B EB, 11:30 AM
Mentor(s): David Arnosti (Biochemistry and Molecular Biology)

Gene regulation is a complex and highly dynamic process, the function of which is difficult to determine using standard biological techniques. Thermodynamic modeling has been used to examine transcriptional regulation of gene expression, which could lead to significant advances in the study of development and disease. Our group has been investigating the regulation and expression of rhomboid, a dorsal-ventral patterning gene in Drosophila melanogaster. 120 model forms were used to investigate protein-protein cooperativity as well as the function of short-range repressors. These models were tested on a number of different input data sets, and model output was compared to normalized expression patterns from confocal images of early blastoderm stage D. melanogaster embryos. Model output was analyzed on three distinct levels to examine general regulatory trends as well as finer details specific to the rhomboid enhancer. 5-fold cross-validation and sensitivity analysis were used to ensure that observed effects were a result of the biological system rather than the mathematical formulation of the model. No consistent trends were observed in cross-validation, suggesting that the model is not over-fitting the data. The sensitivity analysis for virtually all model forms tested is highly similar, and suggests that the parameters of greatest interest are among the most sensitive in the model. The ability of certain models to accurately predict expression of dorsal-ventral patterning genes other than rhomboid indicates that these models likely present an accurate view of gene regulation.

DEPOSITION AND CHARACTERIZATION OF TUNGSTEN TRIOXIDE (WO3) THIN FILMS
David Torres
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Location: 3405B EB, 11:45 AM
Mentor(s): Nelson Sepúlveda (Electrical and Computer Engineering)

The deposition of tungsten trioxide (WO_3) thin films by pulsed laser deposition (PLD) technique and the characterization of its optical properties were investigated. Optical properties and crystal structure of the material were measured using a spectrometer in the visible spectrum (380 -750 nm) and x–ray diffraction (XRD), respectively. An ultraviolet KrF Excimer Laser (λ = 248nm) was used for ablation of the tungsten trioxide targets in an oxygen atmosphere for the deposition process. The focus of the research is to deposit high quality WO_3 thin films, and to characterize their optical transmission through the solid-to-solid phase transition at ~ -50 ° C. After deposition, a Joule – Thompson refrigerator is used to lower the temperature of the samples below the solid-to-solid phase transition point. It is expected to observe a change of the transmission spectrum (in the blue-violet region) of WO_3 with the temperature, due to the material's phase change.

Poster Presentations

MYQSUB
Austin Hendry
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 1
Poster Number: 75
Time: 9:15-10:30 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

Myqsub was developed to aid users in submitting jobs to the HPCC queue. In the simplest case, users submit jobs to this queue and wait for them to be completed. However, the job queue has a limit to the number of jobs it

allows users to submit. Occasionally, users have more jobs than the queue will hold. Myqsub was developed to allow users to submit any number of jobs, even if the queue's designated capacity is reached. When the user reaches their queue's capacity, myqsub is available to hold more job requests. Essentially, myqsub is a queue for the HPCC queue. It stores additional jobs in a text file, which is then read and modified when the queue has space for more jobs. This way, users can submit any number of jobs at once and not worry about having to manually refill the queue if the number of jobs they wish to run outstrips the capacity of the HPCC queue.

USING REINFORCEMENT LEARNING WITH SIFT TO TRACK OBJECTS IN VIDEOS
Patrick Korth
Home Institution(s): University of Michigan, Ann Arbor
Category: Computer Science and Electrical Engineering, Section 1
Poster Number: 76
Time: 9:15-10:30 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

With the increase in video footage used today, it is becoming important to be able to quickly analyze video data. Tracking moving objects is an important facet of this, having applications in security, human-computer interaction, research, and other fields. SIFT (Scale-Invariant Feature Transform), developed by Dr. David Lowe, is an algorithm used to identify and describe interesting points of high contrast in an image, called “keypoints”. First a training image is used to gather keypoint information for an object. Then, the keypoint descriptions are used to identify and locate the object in a different image, regardless of if it is scattered among other objects or if it is in a different position or orientation. The objective of my research is to build on SIFT and use it to track objects in videos. Rather than solely use initial training keypoints, my algorithm learns more keypoints of the object over time and uses these to aid in future tracking. Learned keypoints that appear on the object time and time again are trusted and used to locate the object, whereas those that do not consistently reappear are discarded. Additionally, in order to speed up search time and improve keypoint detection, my algorithm only analyzes the portion of the image in which the object is expected to be. I anticipate that my algorithm will be more reliable in object tracking than basic keypoint matching between frames and that it will be robust enough to be functional outside of controlled laboratory environments.

FAULT TOLERANT ALGORITHMS FOR THE SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS
Kyle Ladd
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 1
Poster Number: 77
Time: 9:15-10:30 AM
Mentor(s): Benjamin Ong (Institute for Cyber-Enabled Research)

As the effective use of multiple computing cores through distributed systems becomes increasingly essential in scientific research, demand for algorithms able to withstand temporary network disruption or failures of individual computing nodes rises. This project seeks to develop fault tolerant algorithms for solving time dependent partial differential equations (PDEs). Fault tolerant design will allow computations to continue in the event of partial failures of computer systems without affecting the integrity of the solution. In phase one, this research will focus on using ideas from multi-level domain decomposition to build resiliency into distributed solutions of elliptic PDEs. Using MPI libraries for communication, coarse grained, multi-level solutions will be explored as a means to incorporate fault tolerance.

AUTOMATED COLOR SPACE EXPLORATION IN IMAGE PROCESSING
Jeremy Martin
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 1
Poster Number: 78
Time: 9:15-10:30 AM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research; Electrical and Computer Engineering)

While genotype research has increased greatly over the past years, problems arise when researchers try to measure with phenotype data. In order to quickly and efficiently collect and process phenotype data, scientific image processing is a necessary tool. With the aid of computers and algorithms to effectively map key features of images, data annotation will go faster than any human would be capable of. While searching for image landmarks, it is important to recognize that images have many ways of being read and displayed. Although "RGB" (Red-Green-Blue) is the most commonly used color space, there are many others such as "HSV" (Hue-Saturation-Value), and "XYZ." Different color spaces will yield different results from the same image. Therefore, it is important to know which color space is the most convenient and best fits the researcher's needs. For my research, I am developing an algorithm to search color spaces and return the one most convenient for a specific research domain. This is done by converting an image to each test color space and performing "template matching" tests. Template matching to takes pieces of an image and matches them as accurately as possible back to their original location. After a series of tests with different sizes and shapes of templates, the color space with the least total distance from the original templates is considered the most accurate. The final goal is to produce a testing algorithm that can be used in any type of image processing domain and return the most accurate color space.

A PARALLEL DISTRIBUTED TREECODE LIBRARY FOR PARTICLE BASED SIMULATIONS OF PLASMAS
Michael McQuiston
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 1
Poster Number: 79
Time: 9:15-10:30 AM
Mentor(s): Benjamin Ong (Institute for Cyber-Enabled Research)

Basic plasma science plays an increasingly significant role in modern society. Some applications include environmental sterilization, communications technology, computer chip manufacturing, and the energy sciences. This project aims to develop a parallel distributed treecode library for particle based simulations of plasmas. The treecode algorithm utilizes particle--cluster interactions instead of particle--particle interactions to reduce the computational complexity from O(n) to O(n log(n)). In this first phase of the project, we study how to distribute the particles in a distributed computing environment, and study the load balancing consequences of our partitioning.

A ZIGBEE MESH-BASED SMART GRID HAN MODEL IN HOME AUTOMATION FOR FINE-GRAINED CONTROL OF ENERGY CONSUMPTION
Akhil Perincherry, Zulhaj Choudhury
Home Institution(s): PES Institute Of Technology, Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Poster Number: 80
Time: 10:45 AM - 12:00 PM
Mentor(s): Joydeep Mitra (Electrical and Computer engineering)

Smart grids, a relatively new concept, refers to an interconnected network of two-way communications – source and hub – in which highly-automated signals communicate back and forth between the utility and monitored locations on the grid. On a participating consumer premise, this would occur between communication-enabled appliances and the meter ("smart meter"). We propose a low power wireless communication system based on using a 16 bit MSP430 MCU as host application processor to the CC2530 making use of the Zigbee protocol. We

design a home area network hub ("HAN hub") interconnecting the smart meter and the loads/appliances through the wireless XBee communications protocol creating what is known as a zigbee mesh. Our project focuses on building a programmable user interface device to enable the user to control the appliance usage to realize the demand response function. The HAN Hub is programmed to isolate the appliances from the smart meter thereby affording the user increased control of appliances on their premises. The design of the Han hub also permits the utility a more granular control of aggregate consumer loads. The MSP430 and CC2530 combination in the proposed system provides a low power and low cost solution for efficient home automation.

ARTIFICIAL NEURAL INTERFACE AND EDUCATIONAL CIRCUIT BUILDING
Brenton Sirowatka
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section
Poster Number: 81
Time: 10:45 AM - 12:00 PM
Mentor(s): Wen Li (Electrical and Computer Engineering)

My summer research internship has consisted of active, integrated research and educational circuit building. I have been assisting a graduate student in pursuance of an artificial neural interface. A few of my objectives include designing a circuit to meet manufacturing restrictions, testing the integrity of biosensors daily, and aiding in animal experiments. To design my circuit, I used drafting software "Autocad." I learned how to interpret manufacturer data sheets to understand device characteristics and dimensions. One biosensor that was tested was a microelectrode array. Several approaches were taken to examine and measure the array. The second part of my internship has been devoted to designing an educational circuit session for high school students. The project I will be presenting is similar to the memory based game "Simon," which will utilize a microcontroller. The circuit tests the gamer's memory by flashing LEDs in sequence and requiring the user to push the corresponding button in the proper order. I have prepared an oral presentation and powerpoint slide that I will be lecturing to summer camps such as the "High School Engineering Institute" and "Spartan International High School Engineering Program." To aid the students in circuit building, I've prepared a sequential guide to building the circuit such that students with no prior experience will successfully complete the Simon project.

UNDERWATER OPTICAL COMMUNICATION SYSTEM
Bin Tian
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Poster Number: 82
Time: 10:45 AM - 12:00 PM
Mentor(s): Xiaobo Tan (Electrical Engineering)

My current research is focused on optical communication systems for underwater robots. Compared to acoustic communication, optical communication has low power consumption and works in medium and short-range distance with fast speed. The omni-directional optical communication system involves light emitting diodes (LEDs). The LEDs used in the test emit green or blue light because of the associated low attenuation factors underwater. The emitted light is detected by a photo diode. Information can be encoded in the flashing patterns of the LED, which is then decoded once received by the photo diode. My project involves the design and testing of a full communication system and its miniaturization for use on small robotic fish. The target communication distance is 5 to 10 meters.

LIGHT FILED IMAGING AND RENDERING
Kaichang Wang
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 3
Poster Number: 83
Time: 10:45 AM - 12:00 PM
Mentor(s): Ning Xi (Electrical and Computer Engineering)

The light field is a combination of light from every direction at every point in space. Lately, the idea of light field has become more and more interesting to people, because it may cause a revolutionary change in image display and development. Light field has a wide range of applications, such as digital refocusing, 3D display, and glare reduction. Through a light field image, it provides additional information which cannot be achieved in traditional optical imaging process. The goal of this project is to develop a computer program that can show the several functions of light field imaging, such as digital refocusing and 3D image rendering using Microsoft Visual C++, for the digital refocusing part, the program takes an array of images as inputs, these images contains the light ray directional information, and each image can be considered as a sub-aperture image. By combining these sub-aperture images together, people can see the image trough certain point of view and certain focus. For the 3D display part, the program takes two sub-aperture images from the array, and the RGB channels of each image are adjusted. For example, the green and blue channels are eliminated in the left image, and the red channel is eliminated in the right image. Finally, people can see the 3D image with blue-red glasses.

SYSTEM INTEGRATION AND PACKAGING FOR AUTONOMOUS ELECTROCHEMICAL GAS DETECTION MICROSYSTEMS IN MINE SAFETY
Matthew Affeldt
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 2
Poster Number: 84
Time: 9:15-10:30 AM
Mentor(s): Andrew Mason (Electrical and Computer Engineering), Haitao Li (Electrical and Computer Engineering)

Underground mines are still a dangerous work environment with many hazards. This project is focused on enhancing safety in underground mines through the autonomous detection of dangerous gasses. The project requires both an effective sensor array to react to the gasses in the mine as well as an integrated system to analyze and store the data in real-time to alert miners to any potential dangers. This part of the project focuses on creating the autonomous system that converts the output of the gas sensor array into easy to understand data for real-time monitoring. This involves creating a printed circuit board (PCB) that is low-power for continuous monitoring the PCB must be low noise to avoid interfering with the output of the sensor array. The system must also be able to communicate with the outside world through visual alerts and digital data that is decipherable in a user-interface on a portable device such as a laptop or a smart phone. Once the design constraints are defined, the board can be created and tested to ensure that all requirements are met and that it correctly interfaces with the gas sensor array.

DESIGN AND EVALUATION OF A ROTATING FIELD EDDY CURRENT PROBE FOR TUBE INSPECTION
Arpita Chand
Home Institution(s): PES Institute Of Technology, Bangalore
Category: Computer Science and Electrical Engineering, Section 2
Poster Number: 85
Time: 9:15-10:30 AM
Mentor(s): Lalita Udpa (Electrical and Computer Engineering)

Inspection of steam generator tubes in nuclear power plants for defects is extremely critical for safe operation of the power plant. In the nuclear industry, steam generator tube inspection using eddy current techniques has evolved over the years from a single bobbin coil, to rotating probe coil (RPC), in an attempt to improve the speed

and reliability of inspection. The RPC probe offers the accurate spatial resolution but involves complex mechanical rotation. This project focuses on the designing of eddy current probes based on rotating fields produced by three identical coils excited by a balanced three-phase supply. The sensor thereby achieves rotating probe functionality by electronic means and eliminates the need for mechanical rotation. The field generated by the probe is largely radial that results in induced currents that flow circularly around the radial axis and rotating around the tube at a synchronous speed effectively producing induced eddy currents that are multidirectional. The probe will consequently be sensitive to cracks of all orientations in the tube wall. A prototype probe is being built to validate simulation results.

HARDWARE DESIGN FOR A NEURAL INTERFACE NODE

Mohammad Hamid Hasnain
Home Institution(s): Indian Institute of Technology, Kharagpur
Category: Computer Science and Electrical Engineering, Section 2
Poster Number: 86
Time: 9:15-10:30 AM
Mentor(s): Karim Oweiss (Electrical and Computer Engineering)

Our research focuses on the first generation of a wireless neural interface designed for continuous recording of spiking activity from many neurons simultaneously in freely behaving subjects. The system is highly modular to permit recording from multiple brain areas simultaneously and in a variety of contexts. My project includes designing of the Printed Circuit boards (PCB) which have to be fitted on the head stage mounted on the head of monkeys to study the neural signals. Due to fix size of pedestal (connected to microelectrode arrays implanted in the animal's brain) and the number of component, it is required to have the smallest possible component available as well as compact and proper placement on the board to have the minimum routing track length. The components on top and bottom of the board are placed in a compact manner so a 6 layer PCB design has been proposed so that there is enough space available for routing. Since there is no hard and fast rule for the design, it turns out to be challenging given the situation. Once the PCB is designed it will be plugged to the pedestal and the whole circuit outside the body will be enclosed in a titanium case. The NIN includes all the analog and digital circuitry required for amplifying, processing, and wirelessly transmitting raw, compressed or spike-sorted neural data in such a way that the final design will transmit the data to a monitoring station.

NEW TYPE OF POLYMER COMPOSITE MATERIAL

Jiacheng Peng
Home Institution(s): Michigan State University
Category: Computer Science and Electrical Engineering, Section 2
Poster Number: 87
Time: 9:15-10:30 AM
Mentor(s): Wen Li (Electrical and Computing Engineering)

My summer program combines research and integrated educational activities. My research is to design, fabricate, and test a new type of polymer composite materials using polydimethylsiloxane (PDMS) and Nafion, which can potentially be used for making flexible sensory skins to detect mechanical force/displacement and pressure. PDMS is optically clear, chemically inert, non-toxic, and mechanically flexible. It is known to be the most widely used silicone-based organic polymer for applications in soft-lithography, microfluidics and biomedical devices. Nafion is a sulfonated tetrafluoroethylene based fluoropolymer copolymer. It has excellent thermal and mechanical stability and has been widely used in many applications such as fuel cells, artificial muscles, and robotic fishes. In addition, I am assisting a graduate student in surface modification of PDMS to sharply decrease its water contact angle and make this characteristic stay longer. The educational activities include the implementation of a hands-on Simon game for High School Engineering institute and Spartan International High School Engineering Program. My role is to program microcontroller, build circuit board and serve as an instructor for above Programs.

Engineering

Oral Presentations

APPLICATIONS OF METALLOPORPHYRIN IN GREEN CHEMICAL ENGINEERING: EVOLUTION FROM HIGH-TEMPERATURE AND PRESSURE TO BIOMIMETIC OXIDA

Charles Chen
Home Institution(s): Michigan State University
Category: Engineering, Section 1
Location: 3540 EB, 9:15 AM
Mentor(s): David Hodge (Chemical Engineering and Materials Science), Chi-Kwong Chang (), Steve S.F. Yu (Institute of Chemistry, Academia Sinica)

Metalloporphyrins are a group of inorganic compounds, and many of them can be found in nature, such as hemin and chlorophyll. Metalloporphyrins have been widely applied in pharmaceutical, cancer therapy, solar cell, material, and biochemical industries for many years. In this research, the goal is to develop a novel oxidation process and understand the nature mechanism, especially hemin. The study contains two sections: molecular modeling and actual application. Modification of hemin, ligand and amino acids is a simple way to understand the relationship between their molecular mechanisms, and enrich the idea in actual application. From the proposed work, hydrogen peroxide would lead the iron(III) of hemin to Cpd 1 [Fe(IV)=O] which is an active state to transfer the electron between Cpd 1 and substrate, and ligand stands as an important role of this study. The actual application of biomimetic P450-like catalyst has been confirmed that it can improve the sugars conversion in enzymatic hydrolysis from poplar heartwood by oxidizing the lignin and polysaccharides. The biomimetic oxidation could reduce the energy consumption than traditional oxidation process by high temperature and pressure, and even become a chloride-free bleaching method. Catalytic oxidation has been developed in wastewater-treatment, paper bleaching and drug synthesis more than 30 years, and searching more catalysts and applications can increase the benefits to make this method closer to the reality in industries.

PYROLYSIS OF SWITCH GRASS FOR BIO-OIL PRODUCTION

Pastor Hurtado
Home Institution(s): Western Michigan University
Category: Engineering, Section 1
Location: 3540 EB, 9:30 AM
Mentor(s): Chris Saffron (Biosystems and Agricultural Engineering)

The production of Biofuels from lignocellulosic biomass such as switchgrass is vital given the current environmental problems and possible energy crisis. Bio-oil is a corrosive liquid composed of a complex mixture of hundreds of oxygenated organic compounds decomposed of the biomass components hemicellulose, cellulose and lignin. The production of bio-oil is dependent upon the feedstock characteristics and the process conditions. Fast pyrolysis is the thermochemical conversion process that produces the highest yields of liquid product. Given the current cost of petroleum, pyrolysis technologies offer a potentially less expensive route to hydrocarbon liquid fuels with minimal modifications required to the existing petroleum infrastructure. Fermentation-based alcohol biofuels such as ethanol have been extensively considered, but they suffer from high cost, limited scalability, and incompatibility with the existing hydrocarbon-based infrastructure. The pyrolysis products of switch grass with and without the catalyst ZSM-5 have been studied. Using the GC/MS it is possible to identify the chemicals produced from pyrolysis and catalytic pyrolysis of switch grass. Using an auger type reactor, it will be possible to compare the bio-oil percent yield of a lab scale reactor to a large scale reactor. Using statistical analysis to identify relationships between composition of feedstock and pyrolysis products it will be possible to evaluate the product profile and selectivity of pyrolysis and catalytic pyrolysis of switch grass. This is a significant step towards creating a renewable source of energy that can replace fossil fuels.

OXYGEN DIFFUSION IN DIFFERENT PACKAGES FOR ORGANIC SOLAR CELLS.
Juan Mena Lapaix
Home Institution(s): Michigan State University
Category: Engineering, Section 1
Location: 3540 EB, 9:45 AM
Mentor(s): Richard Lunt (Chemical Engineering and Material Science), Ruby Ghosh (Physics, Astronomy), Reza Loloee (Physics, Astronomy)

Nearly all commercial solar cells need to be packaged to prevent degradation from moisture, oxygen, and abrasion and we therefore aim to address it by elucidating intrinsic degradation mechanisms and developing novel, multifunctional packages. We aim to apply a hexanuclear molybdenum chloride oxygen sensor to investigate the diffusion of oxygen in different packaging materials of organic photovoltaic solar cells. The phosphorescence lifetime of the sensor is used to determine the concentration and flux of oxygen through barrier layers. Initially, we focused on determining the photophysical properties and applicability of these sensors. The Mo-cluster/poly[1-trimethilslilyl-1-porpyne] (PTMSP) composite's luminescence in the range of 600-900 nm was observed to roughly double when cooled from 298K to 10K and is associated with a red-shift of 10 nm. Although the origin of the spectral shift is unknown, the increase in luminescence likely stems from a reduction in non-radiative recombination rates. A preliminary study of the applicability of the sensor has also been initiated. The lifetime of three samples were measured in the two different oxygen environments and repeated for reliability during sample exchange. While the initial uncertainty of the measurement was as high as 30%, average uncertainties were more typically around 10%. This ultimately limits the absolute oxygen sensitivity measurement for parallel device testing, but we will determine if this is sufficient for barrier-layer characterization.

REDUCING HEART VALVE REPLACEMENT SURGERY BY DESIGN AND MATERIAL
Audrey Meredith
Home Institution(s): Michigan State University
Category: Engineering, Section 1
Location: 3540 EB, 10:00 AM
Mentor(s): Melissa Baumann (Chemical Engineering and Material Science)

Heart Valve Surgery can be very beneficial to a patient with disease or valve failure, but in children, they can outgrow the valve and need another surgery, of the device could fail completely due to the person's age, weight, lifestyle and heart condition. We hope to find the best design, and material to decrease the number of patients needing a second surgery due to mechanical failure.

NON-LINEAR VIBRATION PHENOMENA
Roderick Grant
Home Institution(s): Michigan State University
Category: Engineering, Section 2
Location: 3540 EB, 10:45 AM
Mentor(s): Brian Feeny (Mechanical Engineering)

The random oscillating magnetic pendulum was thought of to create a demonstration to analyze vibrations as well as to analyze if chaos occurs. A random oscillating magnetic pendulum is going to be on a base that is going to be attached to a motor; the base will move in a horizontal motion. Recently there has been a spate of interest in this area of vibration due to the everyday experience of this phenomena. Using this model of ROMP you get a general spring mass system that is used often such as in suspension, create a Equation of Motion (EQM) through knowledge of differential equations to solve for response. Learning more about vibrations can help determine aspects about real life situations such as vehicle suspension and responses due from rocky surfaces. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

LIMIT CYCLES IN DYNAMIC HYSTERETIC SYSTEMS
Joseph Graves
Home Institution(s): Duke University
Category: Engineering, Section 2
Location: 3540 EB, 11:00 AM
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

With the development of robotic fish, current research methods in a variety of fields will be improved because these robotic fish will be able to perform tasks nearly impossible or unfeasible for humans to do manually. Because of these uses, the robotic fish must be able to function properly in many ways, including motion. A mathematical model of equations describing oscillatory motion would roughly describe basic motion of such fish. However, there is a possibility of different models that could improve the motion of the fish in a variety of ways. This research will particularly focus on a system of equations that exhibit a behavior known as hysteresis, in which the history of the input influences the output of the system. Using hysteresis, there is the possibility of creating a more efficient model of motion by combining multiple systems, and thus forming a dynamic system. The impact of the parameters on the output of the different combinations will be compared to their impact on each individual system in order to further optimize the output. Due to this study, it will be possible to optimize the output based on particular parameters and make more efficient robotic fish in terms of motion, an example of which being speed. This scholar is supported by the BEACON Program through a grant from the National Science Foundation.

ENGINE KNOCK
Viet-Dave Tran
Home Institution(s): Michigan State University
Category: Engineering, Section 2
Location: 3540 EB, 11:15 AM
Mentor(s): George Zhu (Mechanical Engineering)

This study seeks to improve small engine power density for optimal performance (torque) and fuel economy. Specifically, this study intendeds to develop greener vehicles that will reduce the use of fossil fuel without the sacrifice of the performance in the vehicle. Engine knock, or pinging is an indicator (irregular sounds) that there is a problem with the air/fuel mixture. To precisely control engine knock in order to have a good knock sensor. The variables that were investigated include the cylinder pressure and ionization signal that were heavily filtered using Matlab, at an engine speed of 1500 RPM (revolutions per minute). This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

Mechanical Engineering

Poster Presentations

THERMALLY ACTIVATED COOLING SKIN FOR AERONAUTICAL PURPOSES
Zach Averill
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 1
Poster Number: 95
Time: 9:15-10:30 AM
Mentor(s): Patrick Kwon (Mechanical Engineering)

The feasibility of a thermally activated cooling skin has been investigated for its potential applications on supersonic jets and vehicles reentering the atmosphere. This film allows for the transfer of heat away from the hull, thus reducing surface temperature and as a result allowing for faster, safer travel. This is an improved Thermal Protection System (TPS) that does more than just block heat, like currently used models, it also aids in its dispersion from the medium. Our current design utilizes zirconium tungstate's (ZrW_2O_8) unique negative coefficient of thermal expansion (CTE) to create a series of tiles that buckle when high temperatures are encountered. The current layout being tested has a ZrW_2O_8 core surrounded by four zirconium dioxide (ZrO_2) tiles, which have a positive CTE. The combination of these two compounds creates a series of tiles that expand radially and shrink tangentially as high temperatures are introduced. When this occurs the structure buckles, creating a gap for cooling gasses to transfer through, thus allowing their passage over the hull of the ship. For experimental purposes this tile arrangement is surrounded by a mixture of ZrW_2O_8 and ZrO_2 that exhibits a CTE of zero. This ensures the sample is contained and secure throughout experimentation. To test different designs, a CNC mill machines each raw tile to the desired shape and a furnace is used to simulate high temperature conditions of 800℃. At this point the layout is being optimized to create the largest possible gap after buckling has occurred.

TAILORABLE, ADHESIVELY BONDED STRUCTURAL COMPOSITE JOINTS
Alexander Bonnen
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 1
Poster Number: 96
Time: 9:15-10:30 AM
Mentor(s): Mahmoodul Haq (Mechanical Engineering)

Adhesively bonded joints have great potential in reduction of structural weight and cost of resulting components and structures. A major concern for acceptability of bonded joints is the initiation of failure due to defects from manufacturing flaws or applied loads. A holistic approach that studied glass fiber composite lap-joints (in-plane tension) by taking into account manufacturing, defect/flaw incorporation and experimental testing was performed. Experimental tests on joints with and without defects (multiple locations) were performed and compared with baseline (no defect) joints. Results indicate that the reduction in the bonded area (due to flaws) significantly lowers the load carrying capacity of the joints. Additionally, the use of novel graphene-reinforced adhesive was used, and showed improvement in damage resistance of resulting joints. These novel adhesives show promise in tailorability of damage properties along with sensing/health monitoring possibilities. Overall, the work shows promise in efficient design of light-weight, tailorable composite joints.

EFFECTS OF FOOTBALL SHOE ROTATIONAL STIFFNESS ON ANKLE LIGAMENT STRAINS AND MECHANISMS OF INJURY UNDER EXTERNAL ROTATION

Mark Davison
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 1
Poster Number: 97
Time: 9:15-10:30 AM
Mentor(s): Roger Haut (Mechanical Engineering), Keith Button (Mechanical Engineering)

Syndesmotic ankle sprains are a debilitating injury, thought to result from excessive external foot rotation. They are characterized by rupture of the anterior and posterior tibiofibular ligaments and the interosseous membrane. Recent studies have shown that the rotational stiffness of a football shoe, characterized as compliant or stiff, influences ankle ligament strains during external foot rotation. Rigid shoes restrict talar translation while compliant shoes permit more talus movement, and consequently greater ligament strains. It has been shown by this laboratory that twenty degrees of foot eversion combined with external rotation predisposes the ankle to syndesmotic injury. It is predicted that when the foot is placed in a football shoe, pre-everted twenty degrees, and rotated to failure, the anterior tibiofibular ligament will experience much larger strains and fail at a lower level of external rotation or torque in a compliant shoe than in a rigid shoe. To calculate the temporal ligament strains of a cadaver specimen, a multibody rigid computational modeling approach was used. Subject-specific models were created from computed tomography scans of the cadaver limbs and a motion capture system tracked markers placed on the tibia and talus. Movement of the talus relative to the tibia was determined within an established joint coordinate system. Results from these movements were used in computational simulations to approximate ligament strains at or near ankle failure. The results of this study may help in the design of footwear in a way that can balance the risk of a syndesmotic ankle sprain to player performance.

BLOOD FLOW CHARACTERIZATION IN THE SKIN DURING NORMAL AND SHEAR LOADING

Josh Drost
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 1
Poster Number: 98
Time: 9:15-10:30 AM
Mentor(s): Tamara Reid-Bush (Mechanical Engineering)

Pressure ulcers are deep penetrating wounds that extend from the skin to the muscle and bone. Ulcers commonly affect people with spinal cord injury, individuals with diabetes and seniors who are bedridden or in wheelchairs. Prolonged loading of the skin, particularly in bony regions, results in a change in blood perfusion which leads to skin damage and tissue ischemia. Measuring changes in blood perfusion can model the likelihood of the formation of a pressure ulcer. This study seeks to relate the reactions of different parts of the human body to normal and shear forces through blood perfusion, primarily the forearm and the sacrum. Blood perfusion will be measured in subjects of various ages both in the forearm and sacral region for three conditions: 1) no forces, 2) normal loading and 3) combined normal and shear forces. This study will determine whether locations of the body will react similarly or differently to loading. Such results will provide a better understanding of the role loading plays in pressure ulcer formation, and can differentiate parts of the body as high risk areas for ulcers.

BIOCHEMOMECHANICAL ROLES OF PERIVASCULAR ADIPOSE TISSUE IN VASCULAR FUNCTION: IMPLEMENTATION TO ABDOMINAL AORTIC ANEURYSM

Albert Feeny
Home Institution(s): Johns Hopkins University
Category: Mechanical Engineering, Section 3
Poster Number: 99
Time: 10:45 AM - 12:00 PM
Mentor(s): Seungik Baek (Mechanical Engineering)

An abdominal aortic aneurysm (AAA) is a dilation in the abdominal aorta. AAA rupture is a serious concern, and is a leading cause of death in individuals over the age of 65. However, the mechanisms of AAA formation and development are not fully understood. In this work, we are investigating potential biochemomechanical roles of perivascular adipose tissue (PVAT) in AAA pathogenesis. To do so, we obtained CT images from AAA patients and studied the anatomical features and geometrical changes of PVAT in these patients. We also conducted an extensive literature survey on the function of PVAT, and analyzed its potential involvement in AAA development. From a chemical-physiology perspective, it is possible that PVAT is a significant factor in the pathogenesis of the aneurysm. It has been observed that PVAT can have a considerable effect on the inflammation of blood vessels, as well as on vascular smooth muscle cell migration and constriction. PVAT also has a biomechanical influence on AAAs, as the presence of the adipose tissue surrounding the blood vessel creates a damping effect on aortic wall expansion. Furthermore, the force applied by the aneurysmal wall to the PVAT tissue may cause adaptation in PVAT tissue as well, which is demonstrated by the decreased PVAT mass in CT images of patients with developed aneurysms. Results of this study suggest that, for future AAA studies and simulations, it is important to take both these chemical and mechanical effects of PVAT into consideration.

SUSTAINABLE ENERGY SYSTEMS ON MICHIGAN STATE UNIVERSITY'S CAMPUS

Jessica Ferko
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 3
Poster Number: 100
Time: 10:45 AM - 12:00 PM
Mentor(s): Andre Benard (Mechanical Engineering)

This project was undertaken to investigate and advocate for energy improvements for buildings on Michigan State University's campus. Attempts were made to develop a comprehensive approach to both improve overall energy efficiency while simultaneously implementing sustainable energy systems. The project specifically targeted Bessey Hall, Berkey Hall, Olds Hall, Ferrel Hall and Psychology. Data was collected regarding energy use of each building over the past few years and then a variety of analysis were completed to see which types of improvements could be made. Specifically, the possibility of using solar technology, wind power and/or geothermal heat pumps were considered for each of the buildings, along with improving energy efficiency through the addition of green roofs, improved pipe insulation and other technology. For each proposed improvement an energy and economic analysis was completed using RETScreen. By inputting building, environmental and energy use data into the program a detailed analysis could be compiled. These reports were able to show the level of improvements that could be made and the investment pay back period. Based on this information comprehensive energy plans could be developed that proposed means by which to improve the environmental performance of each building in a financially feasible manner.

ESTIMATION OF TORQUE DURING EXTERNAL FOOT ROTATION USING AN INSOLE PRESSURE MEASUREMENT SYSTEM

Kathleen Fitzsimons
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 3
Poster Number: 101
Time: 10:45 AM - 12:00 PM
Mentor(s): Roger Haut (Mechanical Engineering), Jerrod Braman (Orthopaedic Biomechanics Laboratories), Brian Weaver (Orthopaedic Biomechanics Laboratories)

Athletics on a track, grass, or artificial turf require traction between the surface and the shoe for optimum performance. However, excessive rotational traction during sports motions may result in injuries. Livesay et. al have measured the rotational stiffness of shoe-surface combinations and suggested that a major risk factor for knee and ankle injuries is the characteristics of the shoe-surface interface. Analyzing kinetics of sports motions outside a laboratory setting is difficult, since an embedded force plate is required to measure ground reaction forces and moments, used in inverse dynamic calculations. Previous studies have used strain gauge transducers, piezoelectric copolymer films, and shoes instrumented with multiple sensors to estimate ground reaction forces during walking, however, these devices are either limited to a particular application or prohibitively expensive. In an earlier study, Fong et al. have shown the use of plantar pressure insoles to estimate the ground reaction forces during walking gait. However, they did not estimate the free moment, which is necessary to predict joint reaction forces through inverse dynamics. The purpose of the current study was to estimate the free moment, during external rotation of the foot, using a plantar pressure insole. After evaluating the correlation between the sensors and the free moment, the sensors with the highest correlation, located in the medial forefoot, were used to estimate the free moment using a linear regression analysis. Validation of this methodology will enable the determination of joint reaction forces that occur during sub-injury motions outside the laboratory on multiple shoe-surface interfaces.

DEVELOPMENT OF QUAD-AXIAL, QUASI-3D COMPOSITES WITH HIGHER IMPACT RESISTANCE

Michael Klein
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 3
Poster Number: 102
Time: 10:45 AM - 12:00 PM
Mentor(s): Dahsin Liu (Mechanical Engineering)

Developing composite materials for vehicle applications has major implications for impact resistance. The goal of this research is to develop a quasi-3D, quad-axial fiber mesh that can be infused with resin to form a composite for use in vehicle manufacturing. The quasi-3D design aims to significantly reduce the delamination tendencies that are a characteristic of laminate composites. The concept of quasi-3D is to expand the mesh to several layers, using a hook technique to interlock each layer and maintain a quasi-isotropic property. This allows for the mesh to be manufactured at various thicknesses to achieve the desired strength. The quad-axial approach produces a uniform mesh with less stress concentrations, reducing weak points. A quasi-3D, tri-axial design has proven to decrease delamination and increase strength in lab testing. Through this research a quad-axial design has been established. Two approaches have been considered for manufacturing the design, weaving and braiding. Weaving limits the design to an orthogonal two dimensional mesh. To manufacture a mesh with more than two axes, a technique known as braiding is used. Braiding is much more complex and requires more specific manufacturing machinery. Because it has been proven through this research that, the geometry for a quad-axial mesh is possible to manufacture through braiding techniques, the focus is now to develop a process that will join orthogonal woven meshes together in a manner that will result in a mesh that has four independent axes and is resistant to delamination.

COMBUSTION OF THICK FUELS IN SIMULATED MICROGRAVITY
Frank Luchini, Jacob VandeHaar
Home Institution(s): Michigan State University, Calvin College
Category: Mechanical Engineering, Section 2
Poster Number: 103
Time: 9:15-10:30 AM
Mentor(s): Indrek Wichman (Mechanical Engineering)

Using a Narrow Channel Apparatus (NCA), microgravity was simulated by suppressing buoyancy effects during the combustion of solid fuel. A new sample holder was designed for thermally thick samples, such as 3/8" PMMA (plexiglass). Flame spread was then studied for varying velocities of airflow over these samples. The results can be applied for material selection in microgravity environments (e.g. on the International Space Station) or to narrow spaces of about 5 mm on Earth (e.g. underneath a house's floorboards).

PULSATING FUEL INJECTED COUNTERFLOW BURNER
Jacob VandeHaar
Home Institution(s): Calvin College
Category: Mechanical Engineering, Section 2
Poster Number: 104
Time: 9:15-10:30 AM
Mentor(s): Indrek Wichman (Mechanical Engineering)

A Counterflow Diffusion Flame Burner (CFB) allows for the controlled and isolated combustion of gaseous fuels. A fuel injector was added to the CFB to spray liquid fuel at specified pulses into the combustion region, similar to what occurs in modern cars. By changing the speed and frequency of injection, the characteristics of the combustion event could be altered. Research goals included characterizing the temperature distribution, determining quenching conditions, and studying flame stability. Observed instabilities included slow rotation and ripple-like behavior. We are currently working to explore the possible transition from a diffusion flame to Flameless Oxidation (FLOX): a low heat, high efficiency form of combustion.

GAUSSIAN-MARKOV RANDOM FIELD PREDICTION USING DISTRIBUTED AGENTS
Justin Mrkva
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 2
Poster Number: 105
Time: 9:15-10:30 AM
Mentor(s): Jongeun Choi (Mechanical Engineering)

This work explores a method for measuring and predicting a spatio-temporal field of interest using a set of computationally limited mobile robotic agents. The agents utilize intelligent swarming and a unique mode switching system to best utilize their limited resources. Models of the robotic swarm in various conditions are evaluated. In future work, real-world data collection will be used to test and validate the approach.

QUANTIFYING THE EFFECTS OF OSTEOPATHIC MANIPULATIVE THERAPY FOR LOWER BACK AND NECK PAIN
Michael Ryerkerk
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 2
Poster Number: 106
Time: 9:15-10:30 AM
Mentor(s): Clark Radcliffe (Mechanical Engineering)

Due to the complexity of the human neuro-musculoskeletal system, it is generally very difficult to analyze the effectiveness of Complementary and Alternative Medicine (CAM) treatments designed to alleviate lower back and

neck pain. Increasingly, patients with various neuromuscular disorders have been relying on a CAM treatment known as Osteopathic Manipulative Therapy (OMT). This study hypothesizes that both the patient's postural control system and motor control in the head-neck system experiences beneficial muscular alterations while undergoing OMT. These changes will be quantified through trunk and head-neck force control and tracking tasks that the patient will be performing during the course of their treatment. These tasks vary in difficulty, with some of them utilizing a six degree of freedom positioning robot in order to simulate additional challenges such as unstable seating. The main priority while using such equipment is the absolute safety of the human subjects participating in the research. One of many precautions being taken is designing a safety circuit which will detect if a subject is accelerating at a rate faster than deemed safe, and initiate a soft stop on the robot ensuring the patient is in no danger. The clinical methods derived directly from this study hope to provide an objective insight into how effectively OMT is able to treat neuro-musculoskeletal issues such as lower back and neck pain. The results can be utilized in order to optimize future treatments in addition to observing a patient's recovery progress in a comprehendible manner.

MECHANICAL CHARACTERIZATION OF GLASS AND CARBON FIBER COMPOSITES FABRICATED BY RESIN INFUSION
Stephen Sommerlot
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 4
Poster Number: 107
Time: 10:45 AM - 12:00 PM
Mentor(s): Alfred Loos (Mechanical Engineering)

Due to the lightweight and high strength characteristics of high volume fraction polymer matrix composites, implementation of such materials for protective panels in vehicles is a function not to be overlooked. To examine the validity of this application, this study offers fabrication details and mechanical testing of glass and carbon fiber reinforced composites with an epoxy resin matrix. Resin Transfer Molding (RTM) and Vacuum Assisted Resin Transfer Molding (VARTM) are presented as means for fabrication, while basic material properties are explored through tensile, shear, flexural and compressive testing. The results from which can be used for comparing future testing of novel alterations of glass fiber composites that contain additives to increase desired material properties, as well as examining the benefits and disadvantages of each fabrication process presented. Future stages of research involve penetration testing that investigates fiber breakage and matrix delamination. This study is supported by the collaboration of the Composite Vehicle Research Center and the Army Research Laboratories, and is the starting point for implementing novel composite material panels in vehicles and ultimately increasing performance and safety.

FATIGUE RESPONSE OF HIGH-PERFORMANCE COMPOSITES
Thomas Stevenson
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 4
Poster Number: 108
Time: 10:45 AM - 12:00 PM
Mentor(s): Xinran Xiao (Mechanical Engineering), Arun Krishnan (Mechanical Engineering)

A composite is a material that consists of two or more constituent components with different mechanical properties which remain separate within a structure. Composites often combine the properties of the constituent materials. There has been great interest in high performance composites (glass and carbon fiber reinforced polymers) in the last decade. High performance composites are chosen over metals because of their superior strength to weight ratio, higher stiffness to weight ratio, as well as their ease of manufacturing. This study aims to characterize the fatigue performance of glass-fiber reinforced polymer composites. Vacuum assisted resin transfer molding (VARTM) will be used to manufacture these composites. Fatigue life will be measured under different stress ratios and S-N curves will be derived from the experiment. This information will be used in a progressive fatigue damage model for the fatigue life prediction of composite structures.

DESIGN AND FABRICATION OF A CAUDAL FIN FOR ROBOTIC FISH WITH VARIABLE ARTICULATING AXIS
Cody Thon
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 4
Poster Number: 109
Time: 10:45 AM - 12:00 PM
Mentor(s): Xiaobo Tan (Electrical and Computing Engineering)

Design and fabrication of a caudal fin for robotic fish with variable articulating axis Cody Thon Under the direction of Dr. Xiaobo Tan, Smart Microsystems Laboratory, College of Electrical and Computing Engineering, Michigan State University Why do fish move their tails differently? Most fish use their caudal fin for propulsion/steering. This research explores the design, manufacture and testing of a robotic caudal fin that will reveal the relationship between two different types of articulation through water. Fish and or mammals articulate their caudal fin either left and right on a horizontal axis, or up and down on a vertical axis. Research entails design, construction and testing of a biologically inspired caudal fin. The robot is outfitted with a specially designed caudal fin that can independently articulate on both the horizontal and vertical axis. This tail portion of the robotic fish is designed using solid works and is manufactured with a 3D printer out of PVC material. The tail houses a servomotor that is connected to a drive shaft. The servomotor allows for the complete control of articulation speed and amplitude. The assembly as a whole will be water proofed up to 105psi using O-rings. The fin is independent of the caudal tail assembly allowing for multiple fin designs to maximize variability. The tail assembly is designed to attach directly to the rigid body on either the horizontal or vertical axis allowing complete independent testing of speed, propulsion, maneuverability and control with results compared and verified through computer simulated modeling.

BONE REMODELING
Ziwei Zhong
Home Institution(s): Michigan State University
Category: Mechanical Engineering, Section 4
Poster Number: 110
Time: 10:45 AM - 12:00 PM
Mentor(s): Arjun Tekalur (Mechanical Engineering), Wei Zhang (Mechanical Engineering)

Bone consistently undergoes remodeling during its life span in order to assure its functional integrity. The remodeling process consists of three major phases: osteoclast resorption, reverse, and osteoblast formation. Non-targeted remodeling means bone resorption due to the metabolic needs, and targeted remodeling means bone formation repairing micro damages. Balancing resorption and formation are significant for maintaining bone's normal capacity. It is widely believed that a hormone deficit will cause the resorption or formation rates unbalanced. It results bone formation inhibited or osteoclast resorption increased. While a bone is under an unbalanced condition, its remodeling capability decreases and eventually reduces the mechanical strength. In earlier works, researchers have noticed that osteocyte, has the ability to amplify the strain from outside. Also, the deformed or apoptosis osteocyte would somehow send biochemical or mechanical signals to osteoclast precursor to trigger the targeted remodeling. In previous experiments, we observed osteoclast resorptions would mainly appear surrounding the linear micro cracking. We then had two major assumptions: there might be communications only between osteocyte and osteoclast; or the osteoclast has sensitivity to micro cracking. In order to define them well, we use a vitro experimental procedure to avoid the influence of other factors. We provide three aspects of the relationships between micro cracking's dimensions and external mechanical loadings; the links between the stress concentration and the osteocyte apoptosis; the reflection of ostoeclast towards micro cracking and damaged osteocyte.

Natural Science

Oral Presentations

TIME OF DAY EFFECTS ON REFERENCE MEMORY AND PLASTICITY GENE EXPRESSION USING THE MORRIS WATER MAZE IN A DIURNAL RODENT MODEL

Brittany Bostic
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Location: 1260 ANH, 9:15 AM
Mentor(s): Antonio Nuñez (Psychology), Carmel Martin-Fairey (Behavioral Neuroscience, Psychology)

The expression of plasticity genes, BDNF (brain derived neurotrophic factor) and TrkB (receptor tyrosine kinase) increases in response to physical activity. BDNF is a growth factor that is important for learning and memory; TrkB, its high-affinity receptor, is involved in long-term potentiation, which is a primary mechanism for associative learning at the cellular level. We are studying how circadian rhythms and physical activity influence the expression of BDNF and TrkB in the hippocampus of diurnal grass rats. Through the use of the Morris water maze (MWM) we are testing time of day differences in reference memory. Eight sedentary animals and eight wheel running animals, housed in a 12h:12h, light:dark cycle will be examined. Each group will be divided in half; 4 animals will be tested at 10 am and 4 animals will be tested at 10 pm. Each animal will have 24 trials and 1 probe trial over the course of 7 days, 2 weeks after the probe trial, each subject will undergo one trial in the MWM. We designed this experiment to test the effects of time of day on acquisition and retention of a hippocampal-dependent task and to examine how learning relates to the expression of plasticity genes in active and sedentary animals. This is important because there has been limited research on plasticity gene expression in a diurnal animal model. Our aim is to create a basic model to explore the optimal time of day for learning, and how it may differ between diurnal and nocturnal species.

CONSTRUCTION OF BIOMOLECULAR SURFACES USING PARTIAL DIFFERENTIAL EQUATIONS

Archie Brown, III
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Location: 1260 ANH, 9:30 AM
Mentor(s): Guowei Wei (Mathematics)

Partial Differential Equations (PDE) analyze the rate of change of multiple variables and to counteract their complexity, we use the Fast Fourier Transform to quickly analyze their results by computer. This information is used to create computer models of biomolecular surfaces primarily the surfaces of proteins. This project will expand on previous work and will predominantly focus on three-dimensional representation of target surfaces. The goal of this study is to demonstrate our model for generating biomolecular surfaces is more efficient than current models such as the van der Waals surface and the solvent-excluded surface (SES). We will examine the time it takes to create surfaces of proteins, accuracy, and the overall appearance of the models against these current established models at comparable conditions. Our model uses the computer languages Fortran 90 and Matlab to solve the high order PDEs and output the visualization. Our objective revolves around improving our model while increasing the complexity of biomolecular surfaces. The benefit of this research is improving image processing of biomolecular surfaces which will decrease the wait period and costs for these models. This will enable chemists and biologists to analyze surfaces such as DNA and viruses quicker and more effectively. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

INFLAMMATORY RESPONSES IN THE INTESTINES DUE TO INTERACTIONS BETWEEN SEROTONIN AND ESTROGEN
Widler Casy
Home Institution(s): Lindenwood University
Category: Natural Science, Section 1
Location: 1260 ANH, 9:45 AM
Mentor(s): James Galligan (Neuroscience, Pharmacology and Toxicology)

This paper is an accumulation of ideas and search results that can help solve guts' inflammatory issues. Various observations in vivo using Mus Musculus gave rise to the hypothesis that serotonin transporter (SERT) knock out female rats tend to develop subclinical inflammation which can result into visceral hypersensitivity. The aim of this research is to investigate the reason why sensory nerves tend to respond to the excess of serotonin and estrogen in wild type and SERT knockout rats. Enterochromaffin cells (EC cells) are critically important in vertebrates in that they produce 90 % of the human's body serotonin (5-Hydroxytryptamine or 5-HT) whereas the other 10% percent is produced in the neurons that are located in the brain. 5-HT is can help regulate various functions in the body such as happiness. Accumulation of 5-HT around the mucosa due to the removal or mutation of SERT can result in serious issues. As the level of serotonin rises, the potentiality for inflammation in visceral organs tends to increase. Serotonin can be transported and broken down further by using SERT. Immunohistochemistry can be used in order to identify whether or not EC cells are present in the small and large intestines. A fluorescent microscope can be used in order to detect the expression of EC cells after staining. The results of this experiment will give rise to more clues that can contribute to the development of treatments for gut inflammation. Interactions between sex hormones and serotonin are also emphasized in this paper.

THE POTENTIAL ROLE OF EVOLUTION OF INCREASED COMPETITIVE ABILITY IN THE SUCCESS OF THE MEDICAGO POLYMORPHA INVASION
Zoe Getman-Pickering
Home Institution(s): Hampshire College
Category: Natural Science, Section 1
Location: 1260 ANH, 10:00 AM
Mentor(s): Casey Terhorst (Kellogg Biological Station), Jennifer Lau (Kellogg Biological Station)

Species that invade novel habitats may be able to flourish if they evolve traits that increase their invasive ability. The Evolution of Increase Competitive Ability (EICA) hypothesis posits that invasive species rapidly evolve to be better competitors following release from enemies in their native range. We tested this hypothesis by comparing the competitive ability of invasive Medicago polymorpha genotypes to genotypes of M. polymorpha from its native range. We conducted a greenhouse study competing 15 native range M. polymorpha genotypes and 19 invaded range M. polymorpha genotypes against 3 competitors native to California. We predicted that the M. polymorpha genotypes originating from the invaded range would have increased fitness (biomass and fecundity) relative to M. polymorpha from the native range. We also examined whether M. polymorpha seeds from the invaded range were more resistant to allelopathic chemicals from their competitors than seeds from the native range. Furthermore we examined whether the presence of symbiotic rhizobial bacteria affected the competitive interactions between M. polymorpha and other species. If M. polymorpha from the invasive range outperform M. polymorpha from the invasive range, it suggests that contemporary evolution may play a role in the ability of species to invade novel habitats.

THE DEVELOPMENT OF AN ANALYTICAL ELECTROCHEMICAL ASSAY FOR MEASURING NOREPINEPHRINE AND NORMETANEPHRINE IN URINE

D'Nisha Hamblin
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Location: 1260 ANH, 10:15 AM
Mentor(s): Greg Swain (Chemistry)

Nitrogen-doped tetrahedral amorphous carbon (ta-C:N) thin-film electrodes are a cheaper alternative for performing electroanalytical measurements than boron-doped diamond thin-film electrodes while possessing many of the same attributes. Concentrations of 1 nM to 100 µM of the neurotransmitter, norepinephrine (NE), and its primary metabolite, normetanephrine (NME), were measured electrochemically as an oxidation current as a function of the concentration to determine the linear dynamic range (LDR) and limit of detection. Flow injection analysis (FIA) with amperometric detection was used at a detection potential of 550mV and575 mV vs. the Ag/AgCl reference electrode for NE and NME respectively. In preliminary work, the LDR was determined as 0.2-100 µM (R=0.986), for NE and 0.1-100 µM (R=0.987), for NME. The sensitivity, slope of the response curve, for NE and NME were 18.24±2.42 nA/µM and 3.21±0.39 nA/µM respectively. These figures of merit were reproduced in triplicate on multiple ta-C:N electrodes and values reported represent their averages. This quantitative data was used to analyze urine samples with unknown amounts of the catecholamines and to determine their exact concentration within. Detecting these compounds in urine shows importance because they are a measure of autonomic nervous system activity, which can be a contributor to hypertension. High NME concentrations in urine can also be linked to tumor presence in the adrenal glands. The combined low production cost of ta-C:N and the simplicity and miniaturization principles of FIA using amperometric detection is expected to provide a more affordable electrochemical measurement tool.

EVALUATING DIFFERENT BRAIN REGIONS THAT CONTROL THE AUTONOMIC NERVOUS SYSTEM IN A DIURNAL RODENT MODEL

Aisha Henderson
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Location: 1260 ANH, 10:45 AM
Mentor(s): Antonio Nuñez (Psychology), Carmel Martin-Fairey (Behavioral Neuroscience, Psychology)

Circadian rhythms are patterns of behavioral, biochemical, or physiological fluctuations that occur approximately every 24 hours (e.g. sleep/wake cycle). These rhythms respond to the light/dark cycle, which results in the entrainment of nocturnal and diurnal animals daily activity (Dibner et al., 2010; Breedlove et al., 2010). The activity of diurnal animals is highest during the day, while that of nocturnal animals peaks at night. Although this is the standard rhythmic process for diurnal and nocturnal species, there are instances of reversals in the preferred phase of activity; such shifts can cause disruption of the circadian control of physiology and behavior. (Salgado-Delgado et al., 2010). Our objective is to use a diurnal rodent model to investigate whether internal temporal desynchronization enhances an animal's risk for acquiring metabolic and behavioral abnormalities (Gritton et al., 2012). Since circadian regulation of the autonomic nervous system (ANS) plays a role in many behavioral and metabolic functions, we plan to examine the effects of shifting activity from day to night on the expression of clock genes in areas of the brain that control the ANS. As a first step, we determined if those genes are expressed in brain regions associated with the ANS. We found that only three regions exhibited clock genes; the nucleus of the solitary tract, the dorsal motor nucleus of the vagus, and the nucleus ambiguous. How this expression is affected by shifts in phrase preference is a future direction of this research plan.

CORRELATED EVOLUTION OF STATIC ALLOMETRY ON A FRUIT FLY
Stephen Kinunda
Home Institution(s): East Tennessee State University
Category: Natural Science, Section 2
Location: 1260 ANH, 11:00 AM
Mentor(s): Alex Shingleton (Zoology)

Allometry is the study of how parts of an organism change with the overall size. Hyperallometric (positive growth rate), hypoallometric (negative growth rate), or isometric (stable growth rate) are three ways to describe scaling relationships. An example, of a hypoallometry would be the growth of a size of a brain. While the heart would represent an example of isometric allometry where there is a constant growth in development. For the following study we used artificial selection over seventeen generations with the fruit fly drosophila to create different lineages. We hypothesized selection for a nutritional static allometry study correlated with a thermal static allometry and that change in wing allometry equals a change in eye, leg, or genital allometry. To measure thermal static, eggs were set at five different temperatures and were left to develop. The results are expected to show how organs have different responses to environmental factors such as nutrition and temperature. While changes in nutritional static do equal a change in thermal static as changes in wing allometry also show variance in leg, eye, and genital allometry. The following study could help us better understand correlations in evolution and morphological differences.

RANDOM WALKS AND APPLICATIONS
Cheyenne Peters
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Location: 1260 ANH, 11:15 AM
Mentor(s): Aklilu Zeleke (Statistics and Probability)

Random walks have been found to have many applications in the sciences and engineering. Random walks have also many interesting mathematical properties. Among others, the following questions have found interest in the mathematical community: Where is the random walker by time n? What is the distance the random walker travels by time n? How often does the random walker visit the initial or starting point? The answers to these questions, among others depend on the dimension of the lattice space on which the random walk is defined. In this work we present numerical as well as analytical results for one and two-dimensional random walks. We will present results for biased random walks as well. Simulation of random walks will be done using the Python programming language. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

PROTEIN FUSION TAGS WITH SWITCHABLE ABSORPTION PROFILES AND/OR FLUOROPHORE ABSORPTION/EMISSION WAVELENGTHS
Duane Simpson
Home Institution(s): University of Maryland. Eastern Shore
Category: Natural Science, Section 2
Location: 1260 ANH, 11:30 AM
Mentor(s): Babak Borhan (Chemistry)

Green Fluorescent Protein (GFP) is a protein that absorbs ultraviolet light from the sunlight, and emits it as lower-energy green light. It is largely used in many laboratories all over the world. GFP allows scientist to track various proteins and viruses in cells as well as winning the 2008 Nobel Committee award. Our laboratory aims at creating an enhanced fluorescent tags that are smaller, allow more control on light emitted, and allow more range on wavelengths. We plan to construct this by using, our engineered proteins. Our proteins can bind to conjugated aldehydes and form Schiff base reactions like visual pigments, rhodopsins. We engineered Cellular Retinc Acid Binding Protein II (CRABPII) to mimic Rhodopsin systems. The large binding cavity of CRABPII can accommodate a variety of chromophores and fluorophores. This allows us to create diverse fluorescent tags. Methods of the

chromophores synthesis will be presented and final compounds will be recognized through 1H- NMR analysis and UV spectrometry. The final compounds of chromophores will be combined with CRABPII mutants and then tested for fluorescent.

FABRICATION PATHWAYS AND CHARACTERIZATIONS OF PLASMONIC ENHANCED NANOREACTIONS
Thiago Szymanski
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Location: 1260 ANH, 11:45 AM
Mentor(s): Chong-Yu Ruan (Physics and Astronomy)

We seek to understand the enhancement effect of the nanoparticle plasmonic network, which can be used to assist photo-chemical and photo-physical processes on the surface of nanoparticle networks. The surface plasmonic resonance phenomena on a single particle level is well understood, but the study in a multi-particle regime of interactions between plasmonic fields from different particles can lead to the discovery of new resonance structures in the frequency and spatial domains. Using colloidal chemistry techniques, we prepare and deposit gold nanoparticles of varying diameters on silicon chips. Through the use of ultrafast diffraction and voltammetry measurements on the prepared samples to monitor the transient response, we determine the photo-thermal and photo-electrical response as a function of particle size and inter-particle distance. These efforts help address the ongoing debate on the role of the inter-particle plasmonic resonance, which so far, has only been described in the optical domain, but not in terms of the physical response. The description of the plasmonic network's physical response is crucial for various applications ranging from photo-induced reactions, catalysis, and nano-electronics.

Poster Presentations

PROLIFERATION OF HUMAN ALVEOLAR EPITHELIAL CELLS DOWN-REGULATES ACE-2 ACTIVITY
Vinh Dang
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Poster Number: 115
Time: 9:15-10:30 AM
Mentor(s): Bruce Uhal (Physiology)

In pulmonary fibrosis, a profibrotic effect is mediated by angiotensin II (ANGII). The accumulation of ANGII is limited by its conversion to angiotensin 1-7 (ANG1-7) by angiotensin converting enzyme-2 (ACE-2). Previous work from this lab demonstrated that ACE-2 is protective against fibrogenesis, but down-regulated in human and experimental lung fibrosis. ACE-2 is expressed primarily by alveolar epithelial cells (AECs), which are quiescent in normal lung but proliferate in lung fibrosis. On this basis, we hypothesized that ACE-2 activity would be dependent on cell cycle progression. It was predicted that ACE-2 activity would be greater in quiescent cultures of human AECs (A-549) compared to their proliferating counterparts. ACE-2 activity was measured by assay with an ACE-2 fluorogenic substrate and normalized to protein concentration. A competitive inhibitor for ACE-2, Dx600, was co-administered to analyze the specificity. In A-549s, ACE-2 activity was five-fold greater in quiescent cells than proliferating cells ($p = 0.0008$). Inhibition of ACE-2 with Dx600 demonstrated high specificity of the fluorogenic substrate. A similar effect was also seen in mouse lung epithelial cells (MLE-12) with similar statistical significance ($p < 0.001$). These data show that proliferation of AECs down-regulates ACE-2 activity as a normal but unfortunate consequence of AEC proliferation during fibrogenesis. This cell culture model can be used to investigate the molecular control of the down-regulation.

IQUID FUELS FROM BIOMASS: A NEW ELECTROCATALYTIC UPGRADING SCHEME
Jack Maguire, Michaelyn Lux
Home Institution(s): University of Rochester, Michigan State University
Category: Natural Science, Section 1
Poster Number: 116
Time: 9:15-10:30 AM
Mentor(s): James Jackson (Chemistry)

Liquid hydrocarbons are the transport fuels of the past… and future. With unbeatable energy to weight ratios, they are "Nature's choice" (as fats) across the tree of (mobile) life, and the foundation of today's chemical industry. But human depletion of their fossil source, petroleum, and atmospheric CO2 buildup from their combustion are pressing concerns. A shift to fuels based on renewable carbon (I.e. biomass) is thus essential. We are researching ways to use solar power to make liquid hydrocarbon fuel from bio-oil, which originates from the CO2 in the air. Jack Maguire: I am using Raney Nickel to electrocatalytically turn bio-oil into liquid hydrocarbon fuel. The bio-oils that we are currently researching are model lignin species, phenol bearing various oxygen substituents. The ideal product (fuel) is cyclohexane, and so far we have been able to convert our substrates to cyclohexanol, an advanced intermediate. Cyclohexane is preferred over cyclohexanol because cyclohexane has a higher specific energy (energy per mass) than cyclohexanol. Michaelyn Lux: A possible way to upgrade bio-oil to an energy rich fuel source is through a SPE system. SPE stands for solid polymer electrolyte; it uses a proton-conductive Nafion membrane as a solid electrolyte. In order to reduce components of bio-oil, a catalytic metal is plated onto the Nafion membrane and a current is run through the SPE cell. This method has successfully reduced several components of bio-oil including acetol and phenol.

GST-PHOSPHATASE EXPRESSION AND DEPHOSPHORYLATION OPTIMIZATION
Pratheeba Palasuberniam
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Poster Number: 117
Time: 9:15-10:30 AM
Mentor(s): Christina Chan (Chemical Engineering and Material Science)

The endoplasmic reticulum is the cellular compartment where proteins fold and undergo modifications. When protein folding in the ER is perturbed, a set of signal transduction pathways is activated to increase folding capacity, the unfolded protein response (UPR). IRE1 is a transmembrane protein that signals the UPR through a process that involves homodimerization and autophosphorylation. Palmitic acid is found to induce UPR signaling in the ER. We want to dephosphorylate this IRE1 protein to study the binding sites of the by testing if palmitic acid can increase phosphorylation. To find out the binding sites, it is necessary to make recombinant IRE1 protein and then treat with phosphatase to remove phosphate groups. We want to insert a phosphatase gene into the Glutathione S-transferase (GST) sequence through in-fusion cloning so that we can express the phosphatase gene. We then performed transformation into competent cells then followed by colony PCR to screen for the colonies with our insert. Finally, our colony will be induced and purified using column chromatography. Next, we have to optimize the dephosphorylation reaction of IRE1 protein with the newly produced GST-phosphatase. There are many factors to consider such as the phosphatase concentration, the buffer contents and pH, the temperature of the reaction and also the time. We have found that 30 min and room temperature was ideal. After successful dephosphorylation, we can test IRE1 with palmitic acid to pin point the location on IRE1 where palmitic acid would bind and also test to see if UPR is induced.

PALMITATE INDUCED EPITHELIAL-MESENCHYMAL TRANSITION IN HEPG2 CELLS
Jason Portis
Home Institution(s): Michigan State University
Category: Natural Science, Section 1
Poster Number: 118
Time: 9:15-10:30 AM
Mentor(s): Christina Chan (Chemical Engineering and Material Science)

The regulation of complex cellular activities in free fatty acid (FFA) treated HepG2 cells involves cooperative interactions between genes. Previous approaches have largely focused on identifying individual target genes, so cooperative functions have remained in the dark. Our approach combined gene expression data with metabolic profiles to select a set of genes for network construction. We determined that palmitate significantly reduces DSP expression, and insulin treatment restores the lost expression of DSP. Insulin resistance is a common pathological feature of fatty liver and related ailments, where the loss of DSP has been documented in liver carcinoma. Reduced DSP expression can lead to the loss cell-to-cell adhesion through desmosomes and disrupt the keratin intermediate filament network. Confocal microscopy analysis of FFA treated HepG2 cells showed reduced levels of keratin expression. Currently we are investigating the effects of palmitate treatment on epithelial-mesenchymal transition (EMT), commonly called metastasis. One technique used to investigate this technique is a scratch migration assay where a wound is induced on a surface of cells and their migration to heal the wound is tracked and measured over time. Western blotting is also used to measure changes in the level of expression, both in keratin and vimentin.

OF A NOVEL ANTI-BIOFILM STRATEGY AND THE PUZZLE OF HOW IT OPERATES
Josh Smith
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Poster Number: 119
Time: 10:45 AM - 12:00 PM
Mentor(s): Chris Waters (Microbiology and Molecular Genetics)

Biofilm formation accounts for many problems in medicine and industry. The diverse genotypic and phenotypic nature of biofilms greatly increases bacterial fitness, and bacteria in a biofilm are also naturally antibiotic-tolerant. Previous strategies have unsuccessfully attempted to resolve biofilm based infections by treating them with antibiotics developed to kill free living planktonic cells. Often, these traditional antibiotics are unable to resolve the infections. Instead of attempting to eradicate cells the way antibiotics do, our group has been developing a novel anti-biofilm strategy based on chemotherapeutically targeting the biofilm itself. We have shown that our main molecule, aptly named Anti-Biofilm Compound 1 (ABC1), effectively reduces the amount of biofilm formed by a high biofilm forming mutant of the gram-negative human pathogen Vibrio chloerae. Serendipitously we also found that ABC1 greatly raises the efficacy of polymyxin B in V. cholerae – a bacteria well known to be naturally resistant to polymyxin B. This begged the question of how ABC1 is interacting with V. cholerae cells, and we are beginning to elucidate the mechanism by which ABC1 works. Firstly, we are continuously growing parallel lineages of a high biofilm forming V. cholera strain in the presence ABC1. Each day an aliquot of the culture is plated on an ABC1-polymyxin B agar plate, and mutants that show tolerance to those conditions are screened against a high concentration of ABC1 alone. The mutants highly resistant to ABC1 will be sequenced, and the most common mutations found among parallel lines will be further investigated.

1D, 2D, AND 3D COORDINATION POLYMERS WITH 4-PYRIDYLISONICOTINAMIDE
Jacob Uebler
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Poster Number: 120
Time: 10:45 AM - 12:00 PM
Mentor(s): Robert LaDuca (Lyman Briggs)

Hydrothermal reaction of cadmiumnitrate, 1,4-phenylenediacetic acid (H21,4-phda), and 4-pyridylisonicotinate(4-pina) afforded the network coordination polymer [Cd3(1,4-phda)2(isonic)2(H2O)2]n (1, isonic=isonicotinate) via in situ 4-pina amide cleavage. Exotetradentate phda ligands connect cadmium ions into [Cd3(1,4-phda)2(OCO)2(H2O)2]n layer motifs featuring cadmium carboxylate dinuclear clusters. In turn these layers are pillared by isonic ligands into a non-interpenetrated 3-D network with a novel 3,4,6-connected {4.62}2{6482}{426883102} trinodal topology. Performing a similar reaction with zinc nitrate afforded the known 3-D phase [Zn(1,4-phda)]n, which possesses a previously unidentified 4,4,4-connected {4.6382}2{426282}{6284} topology. Thermal decomposition and luminescent properties of 1 are also discussed herein. In subsequent experiments using 4-pina, amide cleavage was avoided via room temperature solvent layering. The results of those experiment yielded 1-,2-, and 3-dimensional coordination polymers containing intact 4-pina ligands.

BEHAVIORAL RESPONSES TO TETRODOTOXIN IN ROUGH-SKINNED NEWTS (TARICHA GRANULOSA)
Bryan Walters
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Poster Number: 121
Time: 10:45 AM - 12:00 PM
Mentor(s): Heather Eisthen (Zoology)

Tetrodotoxin (TTX) is a powerful neurotoxin and is used as a chemical agent to defend against predation by a variety of taxa, including rough-skinned newts (Taricha granulosa). TTX is a potent blocker of voltage-gated sodium channels in nerve cells and therefore blocks action potentials, producing lethal effects in most animals. Previous data from our lab demonstrate that TTX generates robust odorant responses in the olfactory epithelium of newts, but we do not understand its behavioral significance. Here we employed an assay in which male adult newts are presented with wedges of foam impregnated with TTX or a control solution in response to three concentrations of TTX. At the lowest concentration, 10 nM, responses are equivocal (n = 2), suggesting that newts may not be able to detect TTX at this concentration. At 100 nM, newts spent a significantly greater percent of their time in the segment containing TTX (n = 4), indicating that newts are attracted to TTX at this concentration. At the highest concentration, 1 μM, newts spent significantly less time in the segment containing TTX than expected by chance (n = 4). Male newts aggregate in large numbers in the wild; at lower concentrations, male newts may be attracted to TTX because it signals the presence of conspecifics. On the other hand, high concentrations may signal the presence of injured conspecifics, and newts may therefore be repelled. This study will help us understand how a compound with an important ecological role can nevertheless assume a secondary role in some contexts.

CADMIUM ADIPATE NICOTINATE COORDINATION POLYMERS
Julie Wilson
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Poster Number: 122
Time: 10:45 AM - 12:00 PM
Mentor(s): Robert LaDuca (Chemistry)

Hydrothermal synthesis has afforded two different coordination polymers that differ structurally due to a pH change. Both of these coordination polymers were synthesized from the same three reactants; 3-pyridylnicotinamide (3-pna), adipic acid (adp), and cadmium nitrate and were structurally characterized by single-

crystal X-ray diffraction. The first of which (1) was synthesized in a basic environment manifests as a one-dimensional (1-D) chain formed from the linkage of neighboring Cd atoms through the adipate and the amide cleavage of the 3-pna which formed a 3-aminopyridine and nicotinate. The second (2) crystalline compound was made in an almost neutral environment and displays a three-dimensional (3-D) 5-connected framework, with ten unique angles and the 4664 topology, constructed primarily from the adipate, the intact 3-pna ligand, as well as the nicotinate which formed as a result of an amide cleavage of the 3-pna. This compound also exhibited a unique water chain which is repeats itself through the entirety of the 3-D complex. Supramolecular hydrogen-bonding interactions through the 3-pna amide linkage are evident in both cases.

SOME REMARKS ON DIOPHANTINE TRIPLES

Tsungai Chibanga
Home Institution(s): Michigan State University
Category: Natural Science, Section 2
Poster Number: 123
Time: 10:45 AM – 12:00 PM
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

Let a, b, c be positive integers. We say the triple (a,b,c) is a d-Diophantine triple if ab+d, bc+d and ac+d are all perfect squares. The most widely studied Diophantine triples are when d = 1. One such example is (1,3,8). The goal of this project will be to characterize different classes of 1-Diophantine triples using recurrence relations and closed forms.

Social Sciences

Oral Presentations

EXAMINING FACEBOOK MOBILE APPLICATION USERS
Pierre Arellano
Home Institution(s): Washington State University
Category: Social Sciences, Section 1
Location: 1345 EB, 9:15 AM
Mentor(s): Emilee Rader (Telecommunication, Information Studies and Media)

People spend a large amount of time connecting with friends and family through Facebook. What is interesting however, is how people use Facebook through their mobile phones. It has been found that the only increase seen in communicating with friends among teens and young adults is from messaging through social networking sites such as Facebook (Lenhart, 2012). Recently, it was announced that iOS 6, the newest software upgrade for iPhones, would include total integration with Facebook which allows them to message each other over Facebook much easier than before as well as like each other's apps, videos, and movies. This integration could also help clear up the path of communication that Facebook inherently lacks. When a user posts on Facebook normally, their message is not addressed to anyone in particular almost like sending a message in a bottle into a vast ocean and hoping for a response. Our study tries to find what happens to communication on Facebook when technology becomes a proxy. We use a series of interviews and ask our study group about their experience when using Facebook while on their mobile phones. The answers that they provide can help us understand how future SNS can be developed. Research has shown that internet connectivity is moving from desktops to mobiles and wireless devices (Lenhart et. al., 2010). Because of this new popularity of mobiles, understanding how Facebook on mobile phones affects human behavior can show us why communication can change because of the interaction between people and technology.

SOCIAL MOBILITY AND ITS IMPACT ON BIRTH OUTCOMES: A REVIEW
Danuelle Calloway
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Location: 1345 EB, 9:30 AM
Mentor(s): Claudia Holzman (Epidemiology), Jamie Slaughter (Epidemiology), Elahé Crockett (Medicine)

By examining the life course perspective of mothers, the association between social mobility and poor birth outcomes such as preterm birth and small-for-gestational-age can be observed. Within this study, papers published in recent years were found using scholarly search engines. The literature was narrowed down to those that were written in English, studying women from a life course/span perspective, and focused on the correlation between social mobility and either preterm birth, low birth weight, and infant mortality.The work was reviewed to observe significant findings and compared the articles to show the strength and validity of the findings from previous literature. Within these studies, the life course perspective was applied by focusing on areas in which many people moved and comparing the maternal childhood information with that of her adulthood through census information, as to changes in social status typically measured using occupation or income relative to a percentage of the national poverty level. Data about the infant was gathered through access to birth records and certificates. Much of the literature shows that the association between social mobility and birth outcomes is significant but can vary depending on the race/ethnicity. This scholar is supported by the REPID Program (Department of Medicine) through a grant from NHLBI.

THE THEORY AND PRACTICE OF MRULE ENHANCES STUDENT SUCCESS IN COLLEGE
Jaqueline Castaneda
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Location: 1345 EB, 9:45 AM
Mentor(s): Lee June (Psychology)

The MRULE project was created in 1996 to address campus race relations at Michigan State University. The program exposes students to structural inequalities, challenges racial thinking, and expands the possibilities of individual actions for those individuals who are conscious of our collective reality (Gazel, 2007). Since then, MRULE has been educating students on social issues and helping to build genuine relationships across traditional boundaries of race, gender, class, sexuality, and nationality. It has the tools to develop leadership and activism skills that any student may employ to their future. However, there have been few studies that have shown how sizable of a contribution MRULE has made to the lives of students. To be able to determine how impactful the program is, the present study explores whether the theory and practice of MRULE enhances student success in college. The results will show if in fact the theory and practice of the program enriches intercultural learning, builds genuine relationships among diverse people, and develops engaged principled leaders, all of which contributes to students' success(Kuh et al., 2005). Comprising a study that elaborates how MRULE's theory and practice contributes to students' success will further illustrate the value of the program.

WHY WERE YOU FIRED? THE ROLE OF GENDER AND RACE IN EVALUATIONS OF EXCUSES AND JUSTIFICATIONS
Amber Cotton
Home Institution(s): Jackson State University
Category: Social Sciences, Section 1
Location: 1345 EB, 10:00 AM
Mentor(s): Ann Marie Ryan (Psychology)

According to the U.S. Bureau of Labor Statistics, approximately 12.7 million Americans are unemployed. Moreover, the job report showed that the unemployment rate among African-Americans at 13%, Hispanics (11%), significantly higher in contrast to Caucasians (7%). It is important to investigate subtle discrimination to understand how these subtle forms affect individuals. Research on interviews shows negative information tends to influence evaluations more strongly than positive information. Many applicants have negative information about their past. A myriad of advice exists regarding effective techniques for discussing negative information. One concern is the validity and usefulness of this advice. Another concern is the intersection of race and gender on how people react to explanations. In this study we examine how an individual presents negative information in a hiring context and whether the acceptability of an explanation differs depending on the race and gender of the individual. We looked at two types of explanations (excuses and justifications) across two ethnic groups(Caucasian and African-American) and both genders.

RELATIONS BETWEEN ANTI-LBGT DISCOURSE AND PREJUDICE IDEATION
Mark Doebler
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Location: 1345 EB, 10:15 AM
Mentor(s): Brent Donnellan (Psychology)

Stories depicting LBGT individuals as victims of crime are often reported in the media. These messages may prime negative attitudes and beliefs about LBGT individuals. The study examines this phenomenon in relation to prejudice, stigma consciousness, and well-being. The study evaluates prejudice as a component of stigma consciousness that is internalized (Herek, 2007). Using a newspaper article designed to prime stigma salience and raise stigma consciousness, the study evaluates the relation between stigma salient discourse and prejudice ideation utilizing a homophobia scale (Wright, Adams, & Bernat, 1999) and transphobia/genderism scale (Hill & Willoughby, 2005). The study also evaluates the relationship between prejudice and personality characteristics as

Authoritarianism (RWA), while considering any possible effects of the phenomenon of Terror Management Theory (TMT). The results of the study will allow for a greater understanding of how we understand prejudice in society.

CHOICE OR OBEDIENCE: PATIENT PERSPECTIVES ON DIABETES MANAGEMENT
Erynn Edwards
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Location: 3546D EB, 9:15 AM
Mentor(s): Linda Hunt (Anthropology), Meta Kreiner (Anthropology)

Managing diabetes is a major public health concern. According to the CDC 2011 National Diabetes Fact Sheet, 25.8 million American people are diabetic. Diabetes is a complex chronic disease that can be treated with multiple treatment alternatives, giving patients many options for managing their condition. Many studies focus on the physician perspective of important factors that promote patient adherence. However, in this analysis, we are exploring the factors that diabetic patients consider when making informed choices about their diabetes care regimen. In our qualitative study, we analyzed 54 diabetic patient interviews and corresponding interviewer field notes to make observations and take a deeper look into how these patients discussed their individual health and treatment regimens. Factors that we will consider are patient knowledge of individual health care regimens, resources for self care, and the nature of how the patients discuss their well-being. Preliminary findings suggest that a primary factor affecting patients' choices is the physicians' clinical authority.

ADDRESSING HEALTH DISPARITIES: CLINICIAN PERSPECTIVES ON LIFESTYLE AND RACE
Dominique Edwards
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Location: 3546D EB, 9:30 AM
Mentor(s): Linda Hunt (Anthropology)

It has been well documented that certain diseases, such as hypertension and diabetes, disproportionately affect racial/ethnic minorities in this country, and there is much clinical interest in addressing these health disparities. Lifestyle choices have been identified as an important modifiable factor affecting these diseases. However, popular stereotypes about the assumed lifestyle characteristics of different racial/ethnic groups may be applied in clinical practice. The present analysis focuses on the management of type 2 diabetes and hypertension as discussed in interviews with 58 clinicians, from 44 primary care clinics in Michigan. In this presentation, we will examine how clinicians discuss lifestyle as impacting health disparities and will highlight how widely shared perceptions of racial difference are applied to their views of the lifestyle choices of racial/ethnic minorities. We will consider how clinicians discuss lifestyle modification as a treatment for diabetes and hypertension, exploring ways their concepts of racial difference may affect the clinical care provided racialized patients.

A CRITICAL ANALYSIS OF THE RECONSTRUCTION ERA AND HOW IT IS TAUGHT IN HIGH SCHOOLS: PORTRAYALS OF THE RECONSTRUCTION ERA
Devin Evans
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Location: 3546D EB, 9:45 AM
Mentor(s): Pero Dagbovie (History)

The Reconstruction Era (1865-1877) is one of the most important, controversial, reverberating, and intriguing time periods in American history; however, in many high schools the era is taught oversimplified. Some textbooks, which teachers use as a guide to teach history, gloss over important issues, people, and events of the Reconstruction Period that should be examined more in-depth. This paper critically examines a textbook used in East Lansing High School in East Lansing, Michigan and offer suggestions on how to expand certain points I feel is necessary to cover more thoroughly. I examine President Abraham Lincoln and his viewpoints towards black

people and his ideas for reconstructing the United States after the Civil War. I also examine the lives and roles of some of the black and white Reconstruction political leaders, some who are not even discussed in many textbooks. I also discuss the thirteenth, fourteenth, and fifteenth amendments to the Constitution and the constitutionality of the amendments and discuss whether the United States federal government had the right to give blacks citizenship and suffrage. Lastly, I will examine the retreat from Reconstruction and how the retreat still affects the United States today. Through a more in-depth study of the Reconstruction Period, twenty-first century learners can have a greater understanding of modern day debates and issues; many debates which first took place during the Reconstruction Period.

WOMEN IN THE ANIMAL RIGHTS MOVEMENT: SEXISM, SPECIESISM AND COMPETING VISIONS OF RIGHTS AND LIBERATION

Mitchell Goldsmith
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Location: 3546D EB, 10:00 AM
Mentor(s): Julia Grant (James Madison College)

This presentation seeks to better understand the social and political location of women in the animal rights movement, particularly in an American context. I will briefly trace the 19th and 20th century rise of animal protection and vegetarian organizations as well as suffrage and temperance movements; with women playing a central role in all four social movements. We will seek to better understand the marginalization of these early movements as well as the women who swelled their ranks. Later we will examine the more contemporary resurgence of animal rights organizations beginning in the 1980's and the way such organizations have changed contemporary western thinking about our treatment of animals. Finally, we will look at the motivations of women who join these movements and their reception by their peers and the opposition, their relationship in the organizational power structure and the progress of feminist and animal liberationist aims in the 21st century.

EXPLAINING THE GENDER GAP IN ACADEMIC ACHIEVEMENT: DISENTANGLING THE MULTIPLE CAUSES FOR UNDERACHIEVEMENT

Angela Gutierrez
Home Institution(s): University of Missouri, Kansas City
Category: Social Sciences, Section 2
Location: 3546D EB, 10:15 AM
Mentor(s): Carlos Navarrete (Psychology)

Although not widely known, female students attain higher GPAs in school, take more challenging course loads, graduate high school at a higher rate, and receive college degrees at a much higher rate than male students. Women also are expected to account for the majority of the workforce in most professional fields in the near future. The gender gap in academic achievement may be even greater among Latino and African American students, which may pose challenges for the economy and our shared understanding of justice and equality. The purpose of this project is to investigate the causes of the gender achievement gap, and to weight competing or complementary theories in light of the evidence. The study will specifically examine the potential for multiple causes along two lines (1) cultural-level concepts that may differ between ethnic groups such gender attitudes, education attitudes, and risk sensitivity; and (2), the potential of subtle forms of bias manifested as double standards in punitive action against minority boys, Methods will rely heavily on qualitative assessment based on quantitative studies, but will also include original quantitative analyses of publicly available data. In particular, data from the 2010 Monitoring the Future study will be used to investigate the roles of social attitudes and risk sensitivity as predictors of academic achievement in a nationally representative sample of 8th, 10th and 12th graders. Thus, in this study we hope to contribute to our current understanding about the academic achievement gap between men and women, facilitate a discourse regarding future interventions, and provide suggestions for greater conceptual clarity for future work among researchers working along these lines.

LITERACY AND AFRICAN AMERICAN LANGUAGE FOR AT-RISK YOUTH
Treavor Hammons
Home Institution(s): Michigan State University
Category: Social Sciences, Section 3
Location: 1235 ANH, 9:15 AM
Mentor(s): Austin Jackson (Residential College of Arts and Humanities, African American Studies)

This project will explore how African American Language and popular culture can be used to assist in literacy learning of at-risk Detroit youth.From writing rhymes for Rap/Hip Hop competitions, to compositing meaning within everyday ”cool” ways of walking, talking, dressing, and addressing, Black male youth index various forms of African American Language (AAL) and Black popular culture for the purposes of communicating meaning, forming community, asserting individual and collective identity and agency. These complex literacy practices, however, are rarely recognized as such by schools and the educational system. Ignorance alone is not the primary culprit; the exclusion or marginalization of what could be termed Hip Hop literacies is fed primarily by deficit approaches to education that preemptively label Black males as functionally and culturally illiterate. Language practices that fall outside of what Morrison calls “state language” ¬ or so-called Standard English ¬ are treated as liabilities instead of linguistic gifts. These types of deficit models translate into deficit approaches to literacy that invariably teaches at-risk Black males to hate the very words they speak. The research I plan to conduct will have Detroit youth engage with their peers and create personal language dictionaries, where the students will explore their own language use and thoughts about what and how they speak. The students will engage in critical ethnography of their own unique culture to reveal how at-risk youth view AAL and its use in society today. Through personal interactions and analyzing their critical ethnographies, I hope to demystify the use and understanding of AAL with at-risk Detroit youth.

EUROPEAN MONETARY SYSTEM REALIGNMENTS
Jade Holmes
Home Institution(s): The Ohio State University
Category: Social Sciences, Section 3
Location: 1235 ANH, 9:30 AM
Mentor(s): Christina Bodea (Political Science)

International cooperation is a goal which many nations aspire to obtain. The European Monetary System was one of the first attempts to unite Europe, yet this particular system ultimately failed. The purpose of this paper is to gain a new perspective on the European Monetary System, its’ functions and the roles market participants played within the system, including the reaction of market participants to European Monetary System exchange rate realignments from 1979-1993, how policy-makers justified the use of realignments and how they were explained to markets, and to what extent, if any, realignments are perceived to be connected to credibility, competitiveness, inflation, the Common Agricultural Policy, intra-EU transfers, trade or the Common Market. It is important to understand old models in order to prevent new systems from failing; the European Monetary System is arguably regarded as the precursor to the European Union, and understanding these particular factors can assist in the perpetuation of the European Union. Moreover, these particular factors have never been analyzed. I have constructed my arguments around sentiments expressed within newspaper articles within the Financial Times, Wall Street Journal, and the Guardian.

ASSESSING THE RELATIONSHIP BETWEEN SOCIAL BONDING AND DELINQUENCY
Lashawndra Hooks
Home Institution(s): Hampton University
Category: Social Sciences, Section 3
Location: 1235 ANH, 9:45 AM
Mentor(s): Charles Corley (Criminology)

This project will examine social control theory and youth’s level of self reported delinquency. Research suggests there is a relationship between a youth’s bond to society and level’s of delinquency. Specifically the proposed

project will examine social bonding opportunities across varying neighborhoods. Hence, it is believed that not all neighborhoods allow similar levels of bonding to occur. To that end, neighborhoods will be categorized into low, medium and high bond communities. In accordance with social control theory variables that enable elements of the bonding process (i.e., attachment, commitment, involvement and belief) will be assessed across varying communities within the Los Angeles area. Thus, in accordance with social control theory it is hypothesized that levels of self reported delinquency will vary in accordance with bonding opportunities provided within neighborhoods. A secondary data analysis will be conducted utilizing the Los Angeles Families and Neighborhoods (LA FANS) data set.

FILLING THE GAP: THE ROLE OF EDUCATIONAL ATTAINMENT IN THE USE OF NONMEDICAL PRESCRIPTION DRUGS
Emmanuel Jackson
Home Institution(s): University of Central Florida
Category: Social Sciences, Section 3
Location: 1235 ANH, 10:00 AM
Mentor(s): Cliff Broman (Sociology)

Epidemiological trends indicate increasing prescription drug misuse, particularly among adolescents and young adults. Several studies have been conducted to show the differences between gender, race, and ethnicity and the use of nonmedical prescription drugs. However, there appears to be a void in literature investigating the role of educational attainment in combination with gender, racial and ethnic differences in young adult nonmedical prescription drug use. Furthermore, majority of the literature focusing on the misuse of these drugs have been derived from adolescent and college samples. Little research has been done exploring how these drugs, and who uses them, are misused from adolescence, past the years of college, and into later stages of adulthood. This research looks to fill this void and inform the reader that gender, racial, and ethnic differences are not the only factors that play a role in the misuse of medical prescriptions drugs, but educational attainment as well. Data for this project will be taken from the National Longitudinal Survey on Adolescent Health and will be conducted using multivariate analysis and logistic regression. This will enable us to examine the differences in nonmedical prescription drug use and will show what important factors are associated with these types of drugs.

FAMILY FORMATION AMONGST AFRICAN AMERICANS WHEN DEPICTING CO-HABITATION VS. MARRIAGE
Adrienne Kilgore
Home Institution(s): Michigan State University
Category: Social Sciences, Section 3
Location: 1235 ANH, 10:15 AM
Mentor(s): Clifford Broman (Sociology)

African American culture chooses co-habitation over marriage due to financial (economic) factors and because of the increase in the equality movements. Thus far, through my research I have noticed that a significant amount of data proves that economic factors are the major drive in the decline in marriage, although they do not affect the quality of marriage. I also have come across in my research that gender equality such as the women's movement has also contributed in ways such as the independence era. Marriage is not a definite outcome anymore and this has affected the rates of marriage as well.

EMOTIONS IN MOTHERS AND CHILDREN
Medina Mathis
Home Institution(s): Michigan State University
Category: Social Sciences, Section 4
Location: 1255 ANH, 9:15 AM
Mentor(s): Kathy Stansbury (Human Development and Family Studies)

Our EMoT (Emotion in Mothers and Toddlers) study will investigate the role of parents in the social, emotional, and cognitive development of their toddlers. Mothers (and fathers, if possible) will visit us in the laboratory in the Child Development Lab that is part of the Human Development and Family Studies department at Michigan State

University. We're hoping to learn about how busy mothers manage the demands of busy toddlers, how mothers teach toddlers about emotion and regulating their emotion, how emotion regulation relates to the toddler's motivation to master a difficult task, and how mothers' own physiological responses to these challenges affects maternal behavior. Mothers and toddlers will participate in several episodes during the lab visit that will allow us to gather these behavioral data. Student volunteers will be involved in many of the following research tasks along with the graduate students in Dr. Stansbury's lab: a) recruiting and scheduling participants, b) laboratory set-up, c) running behavioral protocols, d) collecting questionnaire and interview data, e) entering data into data files, f) working the camera and collecting video data, g) coding video data, and h) collecting physiological data from mothers and toddlers. Undergraduate volunteers are supervised by Dr. Stansbury, as well as by Ph.D. students working with her. There will be opportunities for undergraduates to develop their own small research projects, based on existing or ongoing data, that they can develop and prepare for scientific presentation at the end of the summer.

NAVIGATION 101: A STUDY INTO THE DIVERSE EXPERIENCES OF SUCCESSFUL BLACK MEN'S TRANSITION TO COLLEGE

Jarvis McCowin
Home Institution(s): Virginia Commonwealth University
Category: Social Sciences, Section 4
Location: 1255 ANH, 9:30 AM
Mentor(s): Terry Flennaugh (Teacher Education)

The transition between high school and college for Black males remains to be an under theorized and under researched area in education. This study sought to explore how black males make sense of their transition from high school to college. Black males can be and are effective in college when provided with preparation, adequate resources, and enriching opportunities (Harper, 2012). Factors proven to enhance student's transitions from high school to college are summer bridge programs and first-year college emersion programs. (Strayhorn, 2011; McCurrie, 2009; Wischusen et al., 2011; Walpole et al., 2008). Black men that have persisted through their first-year in college were asked to reflect on their high school and college experiences as well as their transition to college process. The primary investigator sought to better understand the transition by asking students what they did to prepare for their first year in college. Research on the paths and choices of successful black males in college is key in identifying the range of factors that are associated with college attainment (Harper, 2012). Drawing on frameworks from Chickering and Gamson's (1987) Seven Principles of Good Practices in Undergraduate Education and Dr. Shaun Harper's (2012) Anti-Deficit Achievement Framework, interviews with academically successful black male undergraduates were conducted to better understand the experiences and key factors that helped to influence a successful transition from high school to college. Implications for future research along with factors related to increasing black male college readiness, enrollment, and college attainment are included in the study.

MEASURING DISPARITIES IN FOOD ACCESS WITHIN AN URBAN MIDWESTERN POPULATION

Jennifer Messing
Home Institution(s): Central Michigan University
Category: Social Sciences, Section 4
Location: 1255 ANH, 9:45 AM
Mentor(s): Katherine Alaimo (Food Science and Human Nutrition)

The relationship between the food environment – defined as the distribution of food stores and the quality of foods they carry – and a community's health has been of particular interest to researchers in recent years. Literature suggests that food access disparities between neighborhoods exist and that these disparities may play an important role in an individual's dietary intake, which is a key factor in the development (or absence) of various chronic diseases. Food access in urban, low-income neighborhoods and in African American communities are of particular concern because these populations tend to experience the greatest rates of food insecurity. Our research will focus on determining the food environment by census tract within the city of Flint, Michigan. Data from the Michigan Department of Agriculture will be utilized to locate food stores within the city, locations will be verified by a local resident, and then assessors will evaluate stores for the presence, quality, and affordability of

healthy foods. U.S. census data will be utilized in order to explore whether there is a relationship between race, annual household income, and food access within this city. Getting a true picture of the food environment in Flint is necessary to more accurately pinpoint specific locations of concern for future intervention efforts within the city and will be crucial in securing grants for these projects.

UNDERSTANDING AND COMMUNICATING RACE AND CULTURE IN HEALTH DISPARITIES: A REVIEW
Amina Mohamed-Saleh
Home Institution(s): Michigan State University
Category: Social Sciences, Section 4
Location: 1255 ANH, 10:00 AM
Mentor(s): Brandt Peterson (Anthropology)

This study examines scholars, anthropologist and epidemiologist and their focus on the existence of race and culture in health disparities. Race is generally classified as ethnicity, power differentials, genetic and/or as a proxy for class. Culture is composed of two components heritage and adaptation. In recent publications, the biggest concern is finding the practical approach without complicating race and culture in health disparities. The expectations of this research is to examine behaviors, locations, and values, access that mark slippages between "race" and "culture" and "class"? When researchers argue that "race" is not a valid measure for this kind of research, we have to ask: how do we understand racism in all of this without a concept of race? The most important point about defining race and culture is that researchers need to treat race classifications as markers of many complex, interrelated factors in order to find the underlying determinants of disparities.

THE EFFECTS OF PLAY MODE IN VIDEO GAMES
Michael Murray
Home Institution(s): Michigan State University
Category: Social Sciences, Section 4
Location: 1255 ANH, 10:15 AM
Mentor(s): Wei Peng (Telecommunication, Information Studies, and Media)

Recent research within the field of video games' effect on human behavior has concluded that some video games are steadily causing an increase in young adolescent males' aggression levels. However, new advances in video game play such as multiplayer mode and the ability to play over the internet has given rise to many questions concerning their effects. To better understand this, we developed a three phase study to determine how play mode and co-locativness influence a player's aggression after playing a violent fighting game, and if the two variables interact. Our hypothesis is that there will be a main effect of play mode, such that playing with a team member against another will lead to greater levels of aggression after playing a violent fighting game than playing against another person. Also we hypothesize that co-locativness will interact with play mode such that intergroup competition will intensify the effect of co-locativness. During testing, all participants will individually complete a survey to create a base aggression level, after which participants will be broken up into groups of two where they will either play the game in competition setting or collaboration setting (face to face game play or online game play). After the game participants will then take a survey which once collected will be compared with their base results to see if there are any changes in their aggression levels. The goal of this research is to make people more aware of the effects of these play mode settings. This scholar is supported by the SURA Program (Michigan L-SAMP) through a grant from the National Science Foundation.

ROLE OF CONTEXT PITCH AND TIMING CUES IN WORD RECOGNITION IN SPANISH
Jessica Navarro
Home Institution(s): Michigan State University
Category: Social Sciences, Section 5
Location: 3546D EB, 10:45 AM
Mentor(s): Laura Dilley (Communicative Sciences and Disorders), Tuuli Morril (Psychology, Communicative Sciences and Disorders)

Listeners have to use a combination of different acoustic cues in order to divide the continuous speech signal into words. Recent work has shown that word segmentation in the later part of an utterance is influenced by distal prosodic characteristics, meaning those pitch and timing patterns which occur at the beginning of an utterance (Dilley and McAuley, 2008). In previous experiments, whether or not listeners heard monosyllabic or disyllabic words in a lexically ambiguous sequence in English (such as footnote and bookworm or foot, notebook, and worm) was shown to depend on distal prosodic characteristics. The purpose of this study is to determine if these findings will extend to spoken Spanish, a language which exhibits lexical stress patterns. There are numerous minimal pairs that contrast only in their stress pattern; for example, “él jugo” means “the juice,” while “el jugó” means “he played.” Similar to Dilley and McAuley’s study, participants in the current experiment will listen to ambiguous sentences and report the word they hear, indicating which stress pattern they perceived. If Spanish-speaking listeners use pitch and timing information in a similar way to English listeners, the context speech should influence their perception of which stress pattern is heard, and therefore, which word is perceived. The results will help further understanding of how listeners are able to divide the continuous acoustic speech signal into words, as well as on the generality of this process across languages.

IMPROVING MICHIGAN’S AGRICULTURAL POLICY THROUGH TAX REDUCTIONS FOR MAEAP COMPLIANCE
Anthony Papac
Home Institution(s): Harvard University
Category: Social Sciences, Section 5
Location: 3546D EB, 11:00 AM
Mentor(s): Mark Skidmore (Agricultural, Food, and Resource Economics)

The Michigan Agriculture Environmental Assurance Program (MAEAP), a voluntary pollution prevention program, is expected to eventually become compulsory state law. This paper investigates whether tax reductions should be granted to Michigan farmers to better align the costs of complying with MAEAP regulations with the benefits to society of MAEAP compliance. Parcel level data from a single Michigan township as well as county and state level data are spatially and empirically analyzed to determine how property tax policy could be used in conjunction with MAEAP to improve Michigan’s overall agricultural policy. Specifically, to identify the appropriate tax policy changes, we take into consideration the following principles of public finance: the benefits principle, tax competition, tax incidence, and externalities. We expect to link agricultural property tax reductions to MAEAP compliance in a way that: 1) reduces the negative externalities associated with agricultural activity; 2) reduces the high taxes-paid to benefits-received ratio that Michigan farmers are currently subject to; and 3) improves Michigan farm owners’ competitive position relative to farm owners in other states. Findings inform lawmakers of options to better align Michigan’s agricultural policies to socially desirable outcomes.

MINORITY UNDERACHIEVEMENT: AN ADAPTATIONIST APPROACH TO THE RATIONALITY OF “ACTING WHITE”
Vanessa Quiroz
Home Institution(s): Florida International University
Category: Social Sciences, Section 5
Location: 3546D EB, 11:15 AM
Mentor(s): Carlos Navarrete (Psychology)

In the U.S., academic underachievement among Latino and African Americans is a persistent problem. Some researchers argue that, due to a history of oppression and devaluation of non-White cultures, minorities may have developed an oppositional culture to academic success, which rejects individuals who achieve in school, and are

shunned by their peers for "acting white" (e.g., Fordham & Ogbu, 1986;). However, other scholars who have empirically examined explicit attitudes regarding academic engagement have not found evidence to support the notion that minorities do not value academic effort. Thus, support for the idea that academic attitudes differ between racial groups has been elusive (e.g., Tyson et al., 2005). A primary aim of this study is to investigate the possibility that, although explicit attitudes may not differ among ethnic groups, differences in attitudes relevant to academic success may be detectable at non-conscious levels of cognitive processing. Using an Implicit Association Test (IAT) adapted to measure non-conscious bias towards academic activities, we will investigate whether implicit cognition differs with an individual's explicit or conscious attitudes. Given that the IAT has been proven to be a reliable predictor of behavior, if implicit attitudes show to differ, it may prove to be a novel predictor of academic performance. We will also test ancillary hypotheses for factors that may impact academic success, such as: (a) valuing friendships over schoolwork, (b) short-time horizons that affect long-term mindset necessary for academic success, and (c) "macho" attitudes that may hinder learning.

DOES THE EMBODIMENT OF A POSITIVE RACIAL IDENTITY RELATE TO COLLEGE ASPIRATIONS IN BLACK MALES
Ashley Robinson
Home Institution(s): Michigan State University
Category: Social Sciences, Section 5
Location: 3546D EB, 11:30 AM
Mentor(s): Dorinda Carter (Teacher Education)

Equipping all students with equal access to resources that will allow them to have a prosperous future should be the goal of every institution of education. Attending college has been widely regarded as one of the significant factors that ensure an individual a future with possibility. There is scant research exploring black males' aspirations to attend college and the role that a positive racial identity plays in developing these aspirations. The purpose of this study is to shed light on how having a positive racial identity relates to black males aspirations toward college. It is also to fill a void within scholarly research on black males and why they aspire to attend institutions of higher education. Qualitative interviews and surveys were administered to black males who attend East Lansing High School, a predominately white institution. Surveys were administered in order to measure how students view their identity. Preliminary findings reinforce the importance of positive racial identities in the promotion of aspirations toward college.

MIND THE GAP: ALTERNATE FORMS OF ASSESSMENT IN THE CONTEXT OF PUBLIC EDUCATION
Gus Navarro
Home Institution(s): Michigan State University
Category: Social Sciences, Section 5
Location: 3546D EB, 11:45 AM
Mentor(s): Austin Jackson (Residential College of Arts and Humanities)

In the United States, there is a significant gap between those who go on to graduate from public school and those who don't. In 2001, the Department of Education reported that only 72.6% of students graduated that year. By the 2007-08 school year 74.9% of students had graduated from high school. To address the low graduation rate, the federal government passed the No Child Left Behind Act of 2001. In short, this legislation rewards schools with educational accomplishment through monetary means and punishes those without. This academic success is judged on the school's performance on standardized tests. Politicians are constantly trying to improve the school system through the use of standardized testing. Testing and memorization are useful for teaching facts, however, tests and facts are not always accurate evaluations of whether a child is learning. I will be using Paulo Freire's educational theories that offer alternative assessment methods to try and develop a curriculum that encourages students to use creativity in school rather than to simply memorize facts. This will be done in the context of working with students in the My Brother's Keeper program from Detroit. It is time to look at the public school system in America and ask: Why does this achievement gap persist in spite of the rhetoric of public education and what might we do instead?

THE NEW BLACK POLITICS: RACE STILL MATTERS AMONG OTHER THINGS
Jamil Scott
Home Institution(s): University of Maryland, College Park
Category: Social Sciences, Section 6
Location: 1235 ANH, 10:45 AM
Mentor(s): Eric Juenke (Political Science)

African American officeholders are often correlated with majority African American districts. This model does not account for the instances in which African American candidates have won in majority white districts. I evaluate the accepted model of African American success in political campaigns by examining the attributes of the candidate, the local demographics, and the competitiveness of the race in state legislative elections across the United States. There is a critical void in the in the literature on candidate emergence for elective office. I posit that candidate emergence is a two stage process, in which the candidate must first decide to run for elective office and then enters the election race after strategic deliberation. Previous research has focused on officeholders and has ignored this first stage, thus painting an incomplete picture of the voters' choices during an election. I use data from the Black Elected Officials Database as well as original data collected about current legislative campaigns to analyze African American representation using a more realistic model of candidate emergence and voter choice. The findings will be used to predict for the ideal districts for the emergence of minority candidates for political office.

PREDICTORS OF HELP SEEKING AMONG ASIAN AMERICANS IN A NATIONALLY REPRESENTATIVE SAMPLE USING THE COLLABORATIVE PSYCHIATRIC EPIDEMIOLOGY SURVEY (CPES)
Jennifer Thach
Home Institution(s): Michigan State University
Category: Social Sciences, Section 6
Location: 1235 ANH, 11:00 AM
Mentor(s): Frederick Leong (Psychology), Zornitsa Kalibatseva (Psychology)

Previous research has found that racial and ethnic minorities tend to underutilize and prematurely terminate mental health services. However, there is a lack of understanding as to what factors lead certain ethnic groups to seek or not to seek services. Behaviors of help seeking include (1) use of any type of health service, (2) use of formal health services, (3) use of informal health services (spiritual leaders, etc) and (4) use of specialty mental health services. Demographic variables, factors related to an individual's family dynamic and mental health status may be positively or negatively related to seeking mental health services. This study examines how family cohesion, family conflict, socioeconomic status, bilingualism, gender, DSM-IV diagnosis, generation status, social networks and patient perception of care will be related to help seeking behaviors. Using data from the Collaborative Psychiatric Epidemiology Survey (CPES) we examine these predictors among Asian American, Latino, and Non-Latino White adults 18 years and older, with an emphasis on Asian Americans. The sample size of 20,013 enables us to have a national representative sample and make comparisons among racial/ethnic groups. We expect to see that an individual with a DSM-IV diagnosis, bilingual language ability, high socioeconomic status and a strong family cohesion has an increased chance of seeking mental health services.

THE MEASUREMENT OF NEIGHBORHOOD SOCIOECONOMIC CHARACTERISTICS AND RACIAL AND ETHNIC RESIDENTIAL SEGREGATION IN METROPOLITAN HOUSTON
Raymond Thomas
Home Institution(s): Beloit College
Category: Social Sciences, Section 6
Location: 1235 ANH, 11:15 AM
Mentor(s): Joe Darden (Geography)

This research project is related to past research by Darden,et.al (2010) which showed that the pattern of residential (integration or segregation) coupled with socioeconomic characteristics of neighborhoods in 2000 could best explain health disparities by race in Metropolitan Detroit. The goal of this project is to replicate those findings

by reproducing the analysis using Metropolitan Houston and up to date data by: (1) describing the component socioeconomic characteristics of census tracts (neighborhoods) of residence in metropolitan Houston in 2010 using the modified Darden/Kamel Composite Socioeconomic Index that measures socioeconomic position (SEP); (2) Using indexes of dissimilarity to measure the extent of residential segregation between blacks and non Hispanic whites and Hispanics and whites over neighborhoods by SEP of census tracts (neighborhoods) categorized into quintiles based on metropolitan Houston census data in 2010; Data from the U.S. Bureau of the Census American Community Survey (2006-2010 five year estimate) will be used to construct the modified Darden/Kamel Composite Socioeconomic Index. Similar to past research on Metropolitan Detroit, it is hypothesized that, sharp geographic inequality will be revealed by race and socioeconomic status in the Houston metropolitan area. The social and spatial structure created by the index will help researchers and policymakers better understand not only the extent of racial residential segregation but the effects of inequality in racial and socioeconomic neighborhood characteristics on the complex factors related to social disparities in health by race. This research has implications for disparities in other areas as well.

HOW DO AFRICAN AMERICAN STUDENTS' DESCRIBE AND UNDERSTAND THE RELATIONSHIP BETWEEN RACIAL SELF-PERCEPTION AND ACADEMIC ACHIEVEMENT
Alayna Washington
Home Institution(s): Michigan State University
Category: Social Sciences, Section 6
Location: 1235 ANH, 11:30 AM
Mentor(s): Dorinda Carter (Teacher Education)

The study of racial self-perception and its relation to achievement among African American students in predominantly white institutions is important because it is an under-reported and under-researched topic. A majority of previous research conducted on African American racial identity has neglected to link African American students educated in predominantly white institutions perspectives of their race in relation to achievement levels; focus has generally been afforded to African American student achievement in urban or predominantly Black settings. To achieve this purpose, I conducted interviews at East Lansing High School in East Lansing, Michigan with a research team from Michigan State University. African American, male and female students were interviewed. Data was also collected by means of the MIBI (Multidimensional Inventory of Black Identity-Teen). In individual interviews students were asked questions regarding their perspectives on school, race, and achievement. Thus far, my findings suggest that students recognized their race as a barrier in their mobility to achieve in a predominantly white educational setting. Students also found that achieving as a Black student and being involved in the Black community were important. Students varied in their use of race as a motivator to excel, and in resistance to social stereotypes on their race. One larger implication of my study suggests that African American adolescent students' perception of their race plays a role in their achievement levels at predominantly white institutions; in part because, students' perspectives on their race influence their beliefs towards their mobility to excel as a minority in a predominantly white institution.

AVACAR/CARMUNICATION
Leanarda Gregordi
Home Institution(s): Michigan State University
Category: Social Sciences, Section 6
Location: 1235 ANH, 11:45 AM
Mentor(s): Rabindra Ratan (Telecommunications, Information Studies and Media)

This study examines the driver and car relationship on and off the road. More specifically, this study will present the car as two separate entities: one being an extension of the driver, such as personalized emotional attachments or possible body integration and secondly, will view the car as a robot. If the car is seen as a robot, the driver is implied to make social interactions, use automatic responses such as voice activation, and use self drive GPS. To evaluate this study we have created both an online survey and a forty-minute interview to reveal how each participant views their vehicle and how the participant communicates with other drivers on the road. The expectations of this study, is to reveal how the connection with the car influences the way people interact with

one another on the road. For example, if the driver has a personal connection with their car opposed to a detached connection, this relationship will have a higher chance in reducing carelessness and aggression on the road. The driver may see this personal relationship as a "friendship" which increases the likely hood of them not wanting to damage their car. Furthermore, this positive interaction between the driver and their car may increase safety and social capitalism amongst drivers on the road.

PHILOSOPHY OF THE BLACK EXPERIENCE: THE QUEST FOR HISTORICAL SPECIFICATION
Tremante Williams
Home Institution(s): Michigan State University
Category: Social Sciences, Section 7
Location: 1255 ANH, 10:45 AM
Mentor(s): John McClendon (Philosophy)

This research critically evaluates the conventional notions at work within the uniquely Eurocentric episteme specifically and in relation to African American experience within the African American Philosophical Tradition, which consists of multiple schools of thought. Using philosophy of sports and religion, we qualitatively evaluate the distinctively African American experience as well as dialectically explicate such experience to understand the process of formation and development in African American philosophical thought. Thematically, the African American experience is cast in the light of concrete, institutional structures and conditions such as racism, sexism, classism and gender. Historical specification focuses our selection on early non-contemporary African American philosophers as much of their work remains ahistorical, forcing philosophical interpretation to transpire within a vacuum. Thus, we distinguish between the philosophy and the Black experience and philosophy of the Black experience; the former posits the Black experience as the contextual framework of our philosophical inquiry into sports and religion, and the latter posits it (of the Black experience) as the object of investigation. This project, however, is not a proponent of Afro-centric or Afri-centric milieu. Our purpose is not the erasure of particularity on the quest to a centered or centric ideology but it is the greater pronunciation or reconstitution of the particular in discussions or critical dialogues appropriating knowledge, reason and truth that counter, even today, the white norm or Universalist perspective.

GLOBAL CLIMATE CHANGE AND ITS AFFECTS ON VULNERABLE POPULATIONS: AN EXAMINATION OF THE CURRENT DISCOURSE ON ENVIRONMENTAL POLICY
Jessica Williams
Home Institution(s): California State University, Dominguez Hills
Category: Social Sciences, Section 7
Location: 1255 ANH, 11:00 AM
Mentor(s): Jiaguo Qi (Center for Global Change and Earth Observations)

This research addresses the disparities among those negatively affected by global climate change. Vulnerable populations, i.e. ethnic minorities, indigenous groups, and those from low socioeconomic backgrounds, are most susceptible to the negative impacts of global climate change, which result from being under imminent threat of potential cultural loss, displacement, and further marginalization. The need to reevaluate current practices and environmental policy has become more evident as this phenomenon continues to persist. This research asks whether vulnerable populations are being considered in the current discourse of environmental policy, and seeks to better understand the emerging issues of climate change and its societal consequences. Focusing on climate change adaptation and environmental policy, this study will conduct a statistical analysis on environmental conference briefs, looking for trends that mention minorities in the discussions of climate change. Furthermore, a field survey with faculty at the Center for Global Change Science will help facilitate a qualitative understanding of the perspectives of environmental scientists at Michigan State University, and how they account for and prioritize the sociocultural components of climate change. The literature suggests that the exclusive nature of current environmental policy further perpetuates inequality and serves to reinforce the marginalization of underrepresented groups, who are exploited along the characteristics of class, race, gender, and ethnicity. This research will identify the social deficiencies in the current world discussions of climate change and attempts to

gain a thorough understanding of the sociocultural repercussion of current mitigation and adaptive strategies over the next few decades.

USING INFORMATION TECHNOLOGIES IN TANZANIA FOR EDUCATIONAL DEVELOPMENT
Chris Wilson
Home Institution(s): Michigan State University
Category: Social Sciences, Section 7
Location: 1255 ANH, 11:15 AM
Mentor(s): Kurt DeMaagd (Telecommunications, Information Studies and Media) Jennifer Olson (Telecommunications, Information Studies and Media), Erik Goodman (Electrical and Computer Engineering), Eric Tarkleson (Electrical and Computer Engineering)

In the developing world, there has been a push to improve educational quality through the implementation of information technologies (IT). I have found that choices of hardware and software are critically important to the success of IT in developing countries. The goal of this project was to create stable, user-friendly internet labs in Tanzanian schools. To best research this, a case study was developed in 2008, and has since expanded to three primary and two secondary schools in Mto wa Mbu, Tanzania. The operating systems and hardware have evolved to enhance security and functionality. Additionally, studies were made into the receptiveness of teachers and students to the technology in a Maasai tribe school, as compared to comparable public schools. Another priority was finding software that enhances the curriculum without being cost prohibitive or difficult to understand with only a rudimentary knowledge of English. These language barriers led to an increased focus on applications in the Swahili language and visual learning tools. Apart from applications, hardware needed to be found that valued power efficiency, cost, durability and ease of use. As a result of these findings from the case study, this research has shown the potential of using IT for international development, as well as a successful and adaptive model for implementation.

LGBT REPRESENTATION IN MUNICIPAL GOVERNMENT
Ana Wolken
Home Institution(s): Michigan State University
Category: Social Sciences, Section 7
Location: 1255 ANH, 11:30 AM
Mentor(s): Constance Hunt (James Madison College)

Though the gay rights movement has focused on marriage equality in recent years, there has also been a long-standing push for greater representation of the LGBT community in elected office. Since the days of openly gay San Francisco City Supervisor Harvey Milk, many in the LGBT movement have expressed a desire for greater representation in elected office, much the same as other minority groups. This research seeks to identify institutional factors that have an impact on LGBT representation at the local or municipal level. By analyzing data from a random sample of municipalities, I hope to isolate these factors, which may include the form of government used or even election partisanship or non-partisanship. Additionally, I provide case studies of two cities, Houston and New York City, in order to offer insight into the municipal characteristics that contributed to the successful elections of Mayor Annise Parker and Council Speaker Christine Quinn, respectively. These two women and their municipalities provide an interesting contrast. The juxtaposition of historically liberal New York City politics against historically conservative Texas politics may yield insights into municipal factors that contribute to greater LGBT representation. As former House Speaker Tip O'Neill once said, "All politics is local." Thus, the importance of municipal representation cannot be overstated and a thorough analysis of municipal institutional factors is critical. The results of my data analysis and details of the case study are pending. However, I hope to be able to identify factors that impact LGBT representation at the municipal level.

Poster Presentations

GENDER PERFORMANCE DIFFERENCES IN LIFE SCIENCE COURSES
Leah Creech
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Poster Number: 125
Time: 9:15-10:30 AM
Mentor(s): Ryan Sweeder (Chemistry)

This study examined the historical performance of students at Michigan State University in twelve life science courses over thirteen years to find variables impacting student success. Hierarchical linear modeling predicted 25.0 to 62.8 percent of the variance in students' grades in the courses analyzed. The primary predictor of a student's course grade was their entering GPA; except for the second course in a series (i.e. Biochemistry II), where the first series grade (i.e. Biochemistry I) was the best predictor, as judged by their ? values. Student gender and major were also statistically significant for a majority of the courses studied. Female students were predicted to have grades of 0.067 to 0.303 lower than their equivalent male counterparts and majors were 0.088 to 0.397 higher than non-majors. Grades earned in prerequisite courses provided minimal predictive ability. Ethnicity and involvements in Honors College or science residential college were generally insignificant.

I WANT TO MAKE IT BUT CAN I? THE URBAN COLLEGIATE PERCEPTION
LaShawn Hanes
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Poster Number: 127
Time: 9:15-10:30 AM
Mentor(s): Rebecca Jacobsen (Teacher Education)

This research seeks to understand the collegiate perceptions of urban students and identify factors that contribute to this perception. Because understanding whether students who are of college enrollment age are aware of the opportunities to attend a post-secondary institution is critical to increasing the enrollment rates of urban youth, this research can provide important insights. The data used in this research comes from interviews, written responses, and graphic representations created by students from a diverse high school in the Midwest. Specifically, this research asks: "What are urban minority student's perceptions of school beyond the K12 level and does this perception affect their expectation of attending school at the collegiate level? And "What factors contributed to the development of these perceptions?" Results suggest that urban high school students' perceptions of the collegiate experience are heavily influenced by parental involvement and school personnel; however, students report lacking the resources and motivation to actively pursue post-secondary education. Often, students focused on the "fun" associated with college rather than on the study-skills college would require. These findings can inform the work of school counselors and college readiness programs, while leading to more effective programming.

LIMITED FEATURE-BASED ATTENTION TO MULTIPLE FEATURES
Michael Jigo
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Poster Number: 128
Time: 9:15-10:30 AM
Mentor(s): Taosheng Liu (Psychology)

Attending to a feature (e.g., color or motion direction) can enhance the early visual processing of that feature. However, it is not known whether one can simultaneously enhance multiple features. We examined people's

ability to attend to multiple features in a feature cueing paradigm. Each trial contained two intervals consisting of a random dot motion stimulus. One interval (noise) had 0% coherence (no net motion), while the other interval (signal) moved in a particular direction with varying levels of coherence. Participants reported which interval contained the signal in one of three cueing conditions. In the one-cue condition, a line segment preceded the stimuli indicating the direction of the signal with 100% validity. In the two-cue condition, two lines preceded the stimuli, indicating the signal would move in one of the two cued directions. In the no-cue condition, no line segment appeared before the dot stimuli. In several experiments, we consistently observed a lower detection threshold in the one-cue condition than the no-cue condition, showing that participants can enhance processing of a single feature. However, detection threshold was consistently higher for the two-cue than one-cue condition, indicating that participants could not simultaneously enhance two motion directions as effectively as one direction. This finding revealed a severe capacity limit in our ability to enhance early visual processing for multiple features. Our results further imply that recent demonstrations of multiple attentional control settings for features are unlikely due to simultaneous modulations of sensory representations.

RURAL TOURISM AS A DEVELOPMENT STRATEGY IN COSTA RICA
Justine Markey
Home Institution(s): Michigan State University
Category: Social Sciences, Section 1
Poster Number: 129
Time: 9:15-10:30 AM
Mentor(s): Heiner Castillo (EARTH Universidad: Academic Administrator, Summer Consortium Professor)

Costa Rica is known for its use of tourism as a way to promote economic growth. The specific type of tourism I studied was “rural tourism” which has been implemented in areas as a means for development. The purpose of this study was to identify how different capitals existing in a community contribute to the success of tourism as a means for development in rural areas of Costa Rica. The Seven Community Capitals formulated by Flora and Flora (2004) was used as the framework for analyzing the capitals of seven tourism sites throughout the country. Qualitative data was collected by visiting the sites and taking part in the tour while making observations and asking informal questions. This qualitative information will be turned into quantitative information through a final analysis which uses numerical rankings to find the relationship between a successful tourism project and a community’s capitals.

CROWDFUNDING: RISKS AND RULES
Kyle Safran
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Poster Number: 131
Time: 10:45 AM - 12:00 PM
Mentor(s): Rick Wash (Telecommunications, Information Studies and Media), Jacob Solomon (Communication Arts and Sciences, BITLab)

Crowdfunding websites serve as an intermediary between project managers who need funding and donors who want to see their preferred projects completed. However, the donors’ preferences are not always coordinated in such a way that the optimal number of projects achieve full funding. Additionally, donating to these projects entails a risk that your money will be lost to an underfunded project. Some websites attempt to mitigate this risk by implementing a “return rule” which returns all donations to the investors of underfunded projects. It is unclear whether this rule will significantly increase donations, or affect the quantity of fully funded projects. The rule could have a negative impact on donations to safe projects by making what would otherwise be risky donations more attractive. The purpose of this study is to see how donors react to the return rule, how it affects the perceived risk in donating to projects, and the rule’s impact on the number of projects that achieve their funding goals. In order to answer these questions an experiment will be conducted that simulates a crowdfunding situation in the lab in which we will vary the implementation of the return rule across groups, and observe these groups’ ability to fund fake crowdfunding projects.

INNOVATIVE DONATION PROCESS FOR CROWD-FUNDING APPLICATIONS
Kimberly Setili
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Poster Number: 132
Time: 10:45 AM - 12:00 PM
Mentor(s): Rick Wash (Telecommunications, Information Studies and Media)

Everyone needs help finding money for projects and ambitions, especially college students. The Behavior Information and Technology Lab is in the process of creating a crowd-funding platform specifically for students and alumni of Michigan State University and I want to help them. I want to create an application that is innovative and different from other crowd-funding sites. The goal will still be to fund creative projects but the process will not be the same. I interviewed 5 Kickstarter users and talked to them about how they use the site, why they donate money, and what type of projects they donate to. I analyzed the data I got from the interviews and have constructed an affinity diagram. From those conclusions, I will create a prototype and design specifications to implement in the donation process in the current site. This will provide more options while donating and a system that handles money in a way no one has thought of before. Hopefully a new donation process will encourage people to donate to student projects and fund creativity. In the future, other colleges and universities might use these ideas to their own crowd-funding sites.

CONCEPTUALIZING INTERNET USER SECURITY
Alison Thierbach
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Poster Number: 133
Time: 10:45 AM - 12:00 PM
Mentor(s): Rick Wash (Telecommunications, Information Studies and Media)

The purpose of the Internet is to share and distribute information and connect with other people, but many Internet users are concerned with keeping their data secure and private. This has created a problem amongst the current technologies of wireless Internet paired with the dramatic increase in people using the Internet. People are accessing the Internet on multiple devices more frequently and for more tasks and activities. Since this is affecting a greater number of people than has been investigated in the past, further research is needed to explore how Internet users conceptualize what they are doing on their smart phones, laptops, tablets, etc. People have very different resources and experiences with which they are using to make decisions about their security-related behavior. Better knowledge of these differing perceptions of security threats on the Internet can be examined to develop a more effective way to protect users. Through interviews, Internet users can explore their own conceptualizations and perceptions to discuss what they consider a security threat and how these mental models influence their decisions on the Internet. The objectives of this study include: gaining knowledge about what users believe a security threat would look like, what type of information would be susceptible to a threat, and how participants make decisions to protect and avoid these threats.

CONTENT ANALYSIS OF SECURITY EDUCATION MATERIALS CREATED FOR USER CONSUMPTION
Nathan Zemanek
Home Institution(s): Michigan State University
Category: Social Sciences, Section 2
Poster Number: 134
Time: 10:45 AM - 12:00 PM
Mentor(s): Rick Wash (Telecommunications, Information Studies and Media), Alcides Velasquez (Telecommunications, Information Studies and Media)

As times goes on, computers and the Internet are becoming more and more ubiquitous. With the deployment of high-speed Internet connections increasing, the issue of data and systems security has become even more

prevalent. Now, all computer users are faced with security-related decisions throughout their daily activities. These decisions require some degree of technical knowledge, and in order to accommodate these needs a culture of security education has arisen. Previous research has shown that users seek information about computer security from a variety of different sources that include peers, the media, the government, universities, salespeople, among others. This content analysis will examine materials from a variety of different sources in order to understand how each source differs in its approach to computer security education. Materials collected will be meant for an assortment of audiences in fields with varying degrees of technical sophistication. In particular, this study will categorize the prioritization of topics within each source in order to see what is emphasized in different spheres.

Research Mentors

Many thanks to the dedicated research mentors who guided and supported our undergraduate student scholars throughout their summer research experiences.

Marco Agostoni, Plant Biology
Katherine Alaimo, Food Science and Human Nutrition
Evangelyn Alocilja, Biosystems Engineering
Eran Andrechek, Physiology
Phil Angart, Chemical Engineering
Roshan Angoshtari, Genetics
David Arnosti, Biochemistry and Molecular Biology
Seungik Baek, Mechanical Engineering
Venkatesh Balan, Chemical Engineering and Materials Sciences
Shanker Balasubramaniam, Electrical Engineering
Priya Balasubramanian, Pharmacology and Toxicology
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Andre Benard, Mechanical Engineering
Thomas Bieler, Chemical Engineering and Materials Science
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Christina Bodea, Political Science
Babak Borhan, Chemistry
Janette Boughman, Zoology
Jerrod Braman, Orthopaedic Biomechanics Laboratories
Clifford Broman, Sociology
C. Titus Brown, Computer Science and Engineering
Willye Bryan, Entomology
Julia Busik, Physiology
Keith Button, Mechanical Engineering
Scott Calabrese Barton, Chemical Engineering
Dorinda Carter, Teacher Education
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Christina Chan, Biochemistry and Molecular Biology
Chi-Kwong Chang, Chemistry
Chichia Chiu, Mathematics
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Elahé Crockett, Medicine
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Joe Darden, Geography
Tiuana Davis, Zoology
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Kurt DeMaagd, Telecommunications, Information Studies and Media
Laura Dilley, Communicative Sciences and Disorders
Brent Donnellan, Psychology
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Eva Farre, Plant Biology
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Kathleen Gallo, Physiology
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Yan Honggao, Biochemistry
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Cheryl Sisk, Neuroscience
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Jamie Slaughter, Epidemiology
Dalbir Sogi, Food Science and Human Nutrition
Jacob Solomon, Telecommunications Information Studies and Media
Won Song, Food Science and Human Nutrition
Lorraine Sordillo, Large Animal Clinical Sciences
Kathy Stansbury, Human Development and Family Studies
Mariam Sticklen, Crop and Soil Sciences
Greg Swain, Chemistry
Ryan Sweeder, Chemsitry
Banita Tamot, Biochemistry and Molecular Biology
Xiaobo Tan, Electrical and Computer Engineering
Dorothy Tappenden, Biochemistry
Vlad Tarabara, Environmental Engineering
Arjun Tekalur, Mechanical Engineering
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Alcides Velasquez, Telecommunications, Information Studies and Media
S. Patrick Walton, Chemical Engineering

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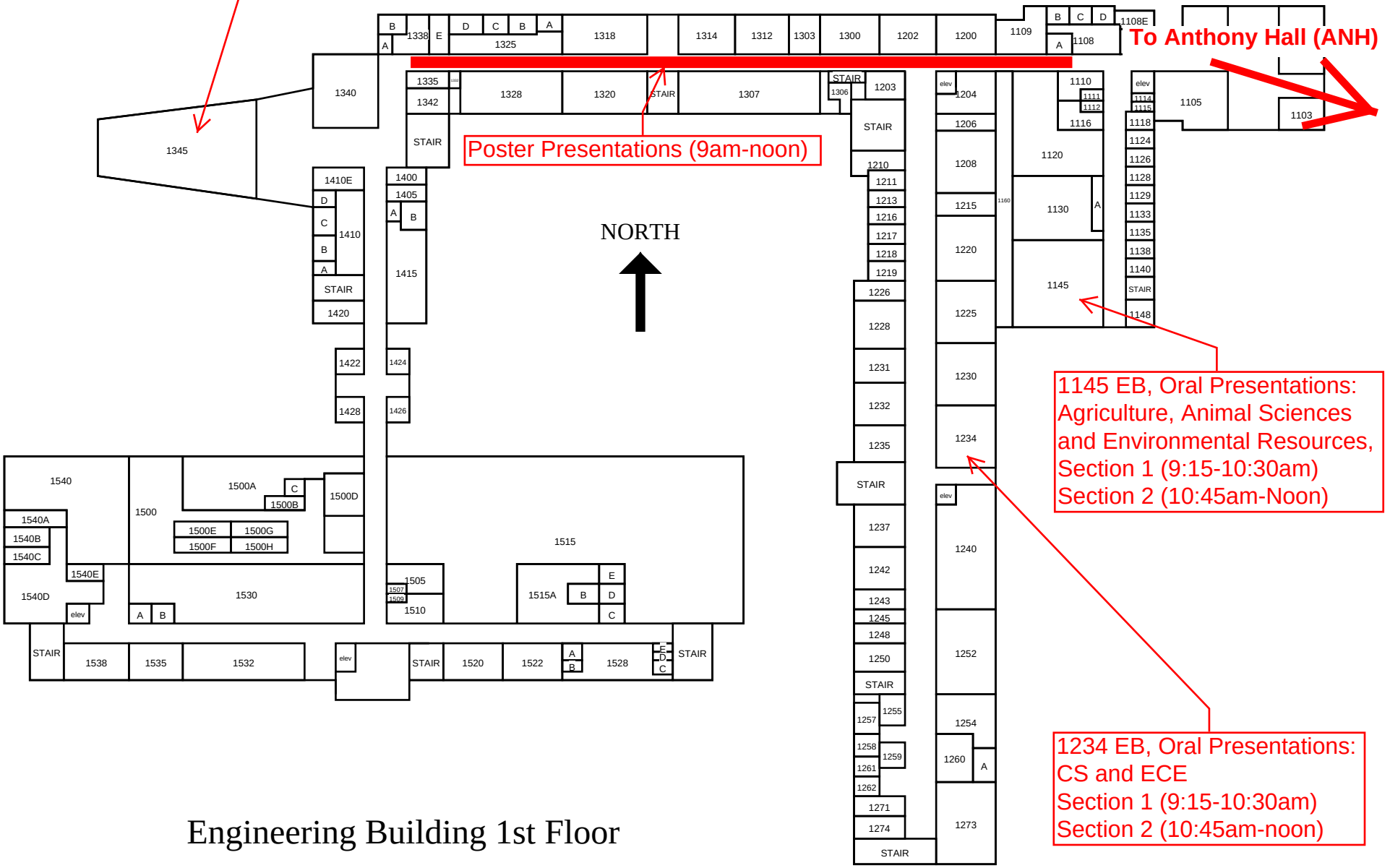
Rick Wash, Telecommunications, Information Studies and Media
Chris Waters, Microbiology and Molecular Genetics
Stephanie Watts, Pharmacology and Toxicology
Brian Weaver, Orthopaedic Biomechanics Laboratories
Guowei Wei, Mathematics
Liao Wei, Biosystems and Agricultural Engineering
Timothy Whitehead, Chemical Engineering and Materials Science
Indrek Wichman, Mechanical Engineering
Curtis Wilkerson, Biochemistry and Molecular Biology
David Williams, Fisheries and Wildlife
Barry Williams, Zoology
Ning Xi, Electrical and Computer Engineering
Hua Xiao, Physiology
Xinran Xiao, Mechanical Engineering
Hui Xu, Pharmacology and Toxicology
Qing Yang, Chemical Engineering and Materials Science
Steve S.F. Yu, Institute of Chemistry, Academica Sinica
Vilma Yuzbasiyan-Gurkan, Microbiology and Molecular Genetics
Aklilu Zeleke, Lyman Briggs College
Wei Zhang, Mechanical Engineering
Yong-Hui Zheng, Microbiology and Molecular Genetics
George Zhu, Mechanical Engineering

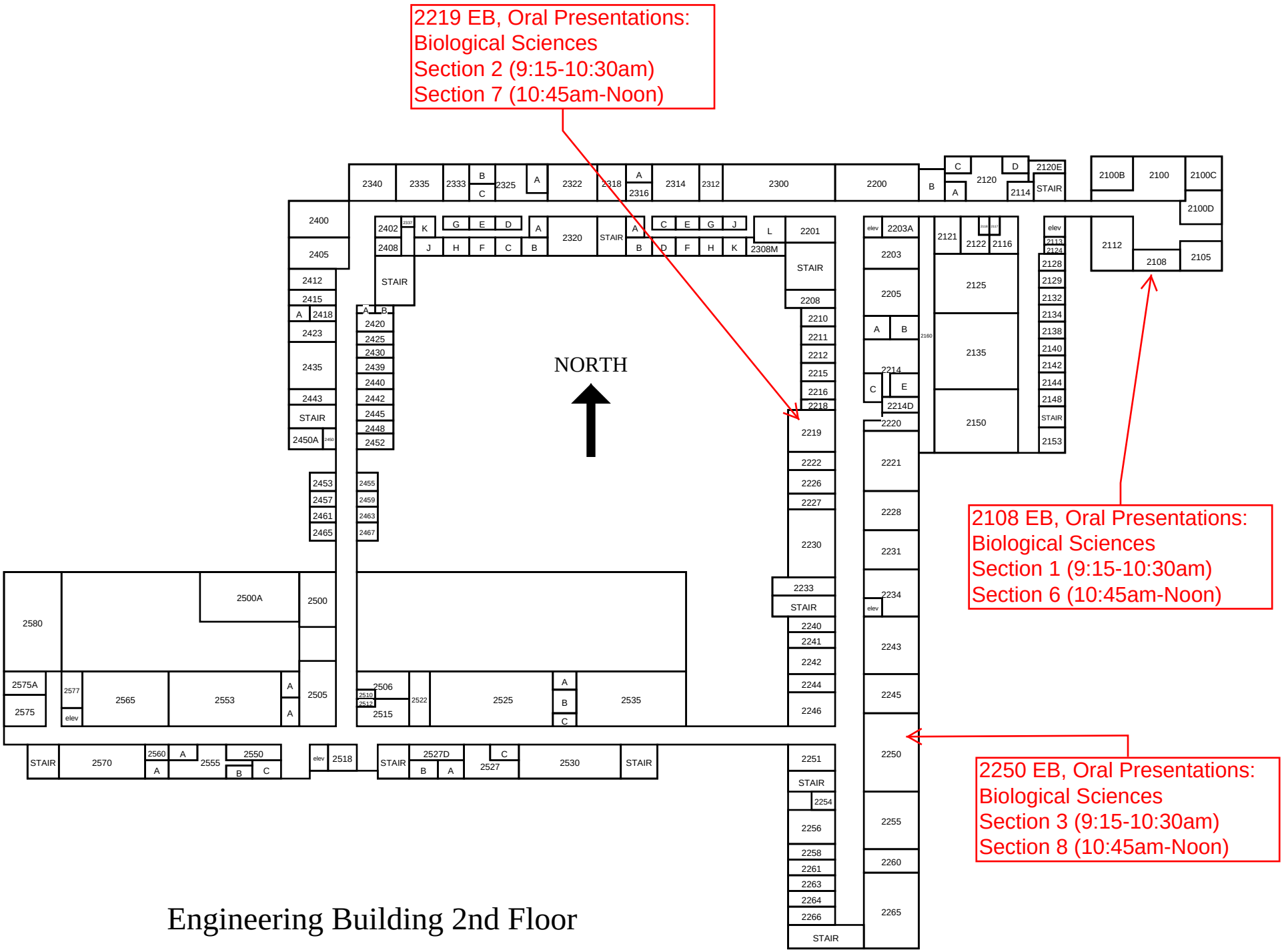
Index of Presenters

Student presenters are listed alphabetically by last name.

Oral Presentations in Anthony Hall (ANH, connected to EB, follow first floor east):
1235 ANH, Social Sciences Section 3 (9:15-10:30am); Section 6 (10:45am-Noon)
1255 ANH, Social Sciences Section 4 (9:15-10:30am); Section 7 (10:45-11:45am)
1260 ANH, Natural Sciences Section 1 (9:15-10:30am); Section 2 (10:45am-Noon)

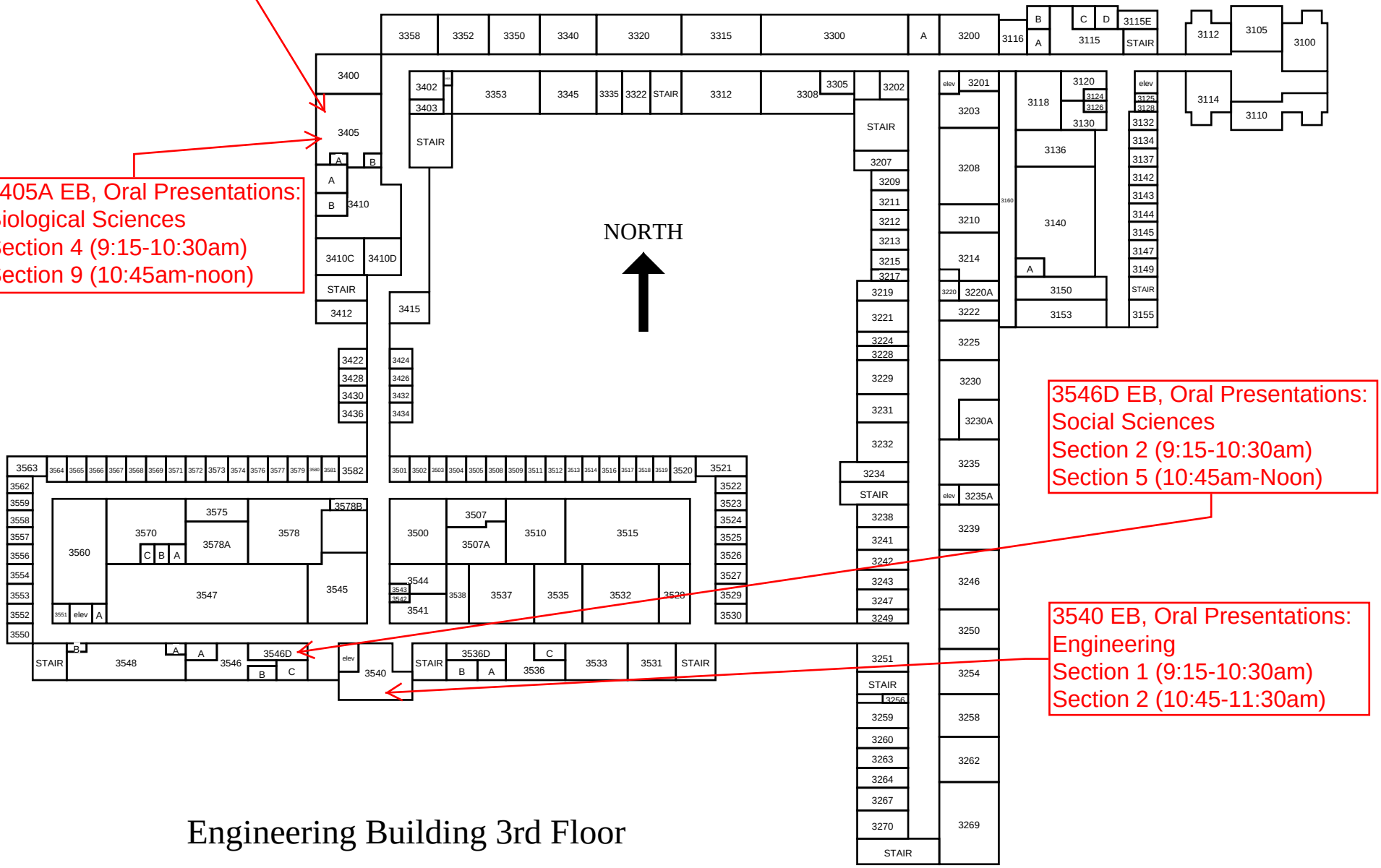
1345 EB, Oral Presentations:
Social Science Section 1 (9:15-10:30am)




2219 EB, Oral Presentations:
Biological Sciences
Section 2 (9:15-10:30am)
Section 7 (10:45am-Noon)
2108 EB, Oral Presentations:
Biological Sciences
Section 1 (9:15-10:30am)
Section 6 (10:45am-Noon)
2250 EB, Oral Presentations:
Biological Sciences
Section 3 (9:15-10:30am)
Section 8 (10:45am-Noon)
NORTH
Engineering Building 2nd Floor

3405B EB, Oral Presentations:
Biological Sciences Section 5 (9:15-10:30am)
CS and ECE Section 3 (10:45am-Noon)

3405A EB, Oral Presentations:
Biological Sciences
Section 4 (9:15-10:30am)
Section 9 (10:45am-noon)



3546D EB, Oral Presentations:
Social Sciences
Section 2 (9:15-10:30am)
Section 5 (10:45am-Noon)

3540 EB, Oral Presentations:
Engineering
Section 1 (9:15-10:30am)
Section 2 (10:45-11:30am)

Engineering Building 3rd Floor