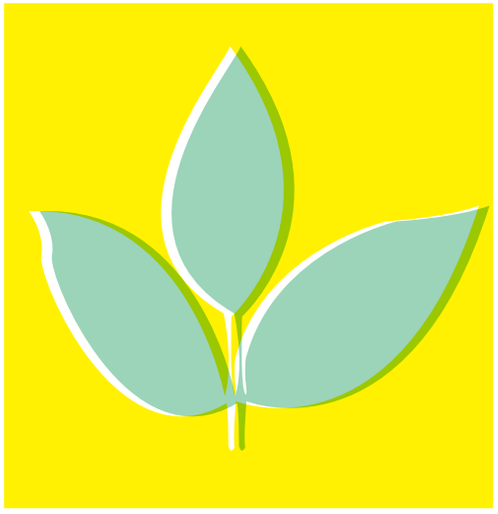
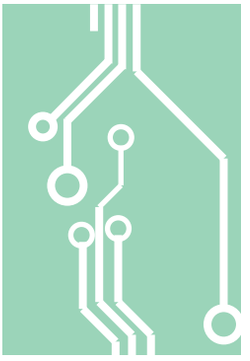
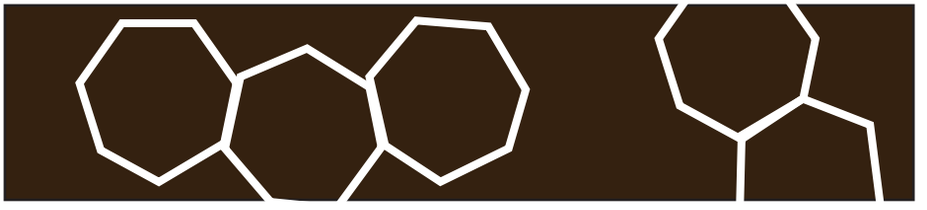




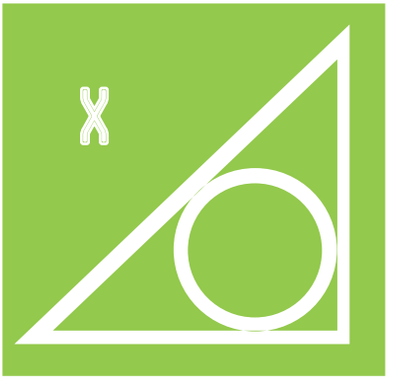
MICHIGAN STATE UNIVERSITY

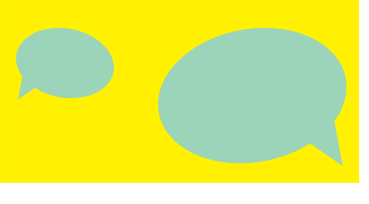
2013 MID-SURE



WEDNESDAY
JULY 24, 2013

MID-MICHIGAN SYMPOSIUM FOR UNDERGRADUATE RESEARCH EXPERIENCES





WELCOME

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

Undergraduate students from diverse academic disciplines will present their outstanding research and creative endeavors. Approximately 262 students from 75 different institutions are participating in today's event. These students are mentored by 263 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, research mentors, and guests to walk around the forum and learn about the impressive work of our next generation of scholars and researchers. Thank you for joining us.

MID-SURE PLANNING COMMITTEE

Megan Shannahan
Assistant Director, Undergraduate Research

Korine Wawrzynski
Director, Undergraduate Research

Judi Brown Clarke
Diversity Director, BEACON

Katy Luchini Colbry
Director for Graduate Recruiting, Engineering

Steven D. Thomas
Program Manager, The Graduate School

Lindsay Gluf
Program Coordinator, REPID

Robert Coffey
Graduate Assistant, Undergraduate Research

Emily Bank
Summer Intern, Undergraduate Research

Cover image designed by Sofija Dutcher, '13, BFA Studio Art, Graphic Design.

MICHIGAN STATE
UNIVERSITY

UNDERGRADUATE RESEARCH AT MSU

MSU UNDERGRADUATE RESEARCH INITIATIVE

Michigan State University's Undergraduate Research Initiative strives to increase opportunities for students to engage in research, scholarship, and creative activity and expand the pool of faculty and partners engaging students in their scholarly work. The Undergraduate Research Office annually disperses undergraduate research grants, sponsors professional development workshops, awards undergraduate research travel grants, and creates materials to promote undergraduate research. The office sponsors two undergraduate research forums annually: the University Undergraduate Research and Arts Forum (UURAF), held each April, and Mid-SURE, held each summer. For more information about MSU's undergraduate research initiative, visit urca.msu.edu or contact Dr. Korine Wawrzynski at steinke7@msu.edu

PARTNER PROGRAMS

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

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, and 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 and participate in weekly professional development activities designed to help students understand and prepare for graduate studies. For more information, contact Dr. Katy Luchini Colbry, Director of Graduate 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 Steven D. Thomas, Program Manager at 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.

REPID

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

TABLE OF CONTENTS

SCHEDULE OF EVENTS

All events occur in the Breslin Center.

TIME	EVENT	LOCATION
11:00 AM – 1:00 PM	Presenter registration	Ticket office lobby
1:00 – 2:45 PM	Session 1 presentations	Concourse level
2:45 – 3:15 PM	Break	
3:15 – 5:00 PM	Session 2 presentations	Concourse level
1:00 – 5:00 PM	Graduate school fair	Concourse level

POSTER PRESENTATION SCHEDULE

All posters will be displayed during the entire event, but students will only be present during the following assigned times:

CATEGORY	SESSION 1 SECTIONS 1:00 – 2:45 PM	SESSION 2 SECTIONS 3:15 – 5:00 PM
Agriculture & Animal Science	1	-
Biochemistry and Molecular Biology	1, 2, & 3	4, 5, & 6
Biosystems & Agricultural Engineering	1 & 2	3 & 4
Cell Biology, Genetics, & Genomics	1 & 2	3, 4, & 5
Chemical Engineering & Materials Sciences	1 & 2	3 & 4
Civil & Environmental Engineering	1	-
Computer Science & Engineering	1	2 & 3
Electrical & Computer Engineering	1	2
Environmental Science & Natural Resources	1	-
Epidemiology & Public Health	1	2 & 3
Integrative Biology	-	1 & 2
Mechanical Engineering	1 & 2	3 & 4
Physical & Mathematical Sciences	-	1
Social, Behavioral, & Economic Sciences	1 & 2	3 & 4

SROP & REPID ORAL PRESENTATIONS

Students in the MSU SROP and REPID programs will be giving a special session of oral presentations prior to the official start of Mid-SURE. The presentations are open to the public to attend and will take place in Meeting Rooms A-D on the Mezzanine level.

	MEETING ROOM A	MEETING ROOM B	MEETING ROOM C	MEETING ROOM D
8:00-8:15 AM	Rolando Barajas	Melissa Chavez	Mia Cook	Paul Garza
8:15-8:30 AM	Brittany Childs	Cierra Cole	Huei-min Ni	Brian Harvey
8:30-8:45 AM	Melanie Callaghan	Azel King	Karl Alcover	Fritz Bondoa
8:45-9:00 AM	Sebastien Dalencourt	Natasha Myhal	Desirae Smith	Danielle Brown
9:00-9:10 AM	BREAK			
9:10-9:25 AM	Yingli He	Kyrah Holland	Audrey Meredith	Robert Frisk
9:25-9:40 AM	Mary Lian	Indrea Joplin	Traniece Fullwood	Rinaldi Romulus
9:40-9:55 AM	Markita Lewis	Claudio Calderon	Megan Covington	Avery Blanks
9:55-10:10 AM	Jonathan Turkus	Mose Pacheco	Kidiocus Carroll	Michelle Samalik
10:10-10:20 AM	BREAK			
10:20-10:35 AM	Violeta Nieves	Angel Trevino	Carlos Moreno	Christopher Ramsey
10:35-10:50 AM	Kristina Savage	Nathan Gray	Samantha Padilla	Gregory Repka
10:50-11:05 AM	Trey Gilpin	Kevin Jock	Katrin Reeder	Monique Noel
11:05-11:20 AM	Andrea Jackson	Manuel Henry	Priya Lall	Sam Taylor

GRADUATE SCHOOL FAIR

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

INSTITUTION	DEPARTMENT
Adler School of Professional Psychology	
American University of the Caribbean School of Medicine	
Ball State University	Graduate School/Department of Chemistry
Cleary University	
Cooley Law School	
Michigan Technological University	Graduate School
Michigan State University	BioMolecular Science Gateway
Michigan State University	College of Communication Arts and Sciences
Michigan State University	College of Human Medicine
Michigan State University	College of Engineering
Michigan State University	Graduate School
Northwestern University	McCormick School of Engineering and Applied Science
Purdue University	Graduate Programs
St. George's University, Grenada	
The George Washington University	School of Engineering and Applied Science
University of Michigan – Dearborn	Graduate Studies
University of Notre Dame	ESTEEM/Patent Law
Van Andel Institute	Graduate School
West Virginia University	Graduate Programs AND College of Engineering

ABSTRACTS

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

AGRICULTURE & ANIMAL SCIENCE

THE EFFECTS OF A DENSITY SHIFT ON NESTING AND MATING BEHAVIOR IN A SPECIES OF STICKLEBACK FISH

Ellyse Cipolla
Home Institution: Michigan State University
Category: Agriculture and Animal Science, Section 1
Poster: 1
Time: 1:00 PM - 2:45 PM
Mentor(s): Emily Weigel (Zoology)

When habitats are altered or fragmented, the populations living in that area can be affected, too. Such affects can act not only on the behaviors of the organisms present, but also on the population's size and distribution. If a population experiences a change in population density, then courtship behaviors should change to maximize matings and reproductive success. We show this using a model system, the three-spined stickleback, Gasterosteus aculeatus. We experimentally manipulated male density (high or low) and randomly assigned individuals to single-male nesting tanks (n=40). We then exposed the males daily to females and recorded nesting and courtship behavior, male nuptial coloration, and nest weight. From our data analysis we expect to see that the low density treatment on average nest earlier in the season and have lighter throat coloration than the fish from the high density treatment. The differences seen in mating and nesting behavior between the two treatments is likely attributable to energetic constraints imposed by density: low density males may invest more in their nests to maximize reproductive effort as a tradeoff for producing less nuptial coloration. In contrast, high density males may invest more in their throat coloration to woo a mate and less in a nest that may be destroyed by competing males. This research suggests that rapid changes in demography have the power to shape evolutionary trade-offs in mating.

ABNORMAL FLOWERING TIME DUE TO LOST OF UPF2 REQUIRES THE MASTER FLOWERING GENE FLC

Traniece Fullwood
Home Institution: Miami Dade College
Category: Agriculture and Animal Science, Section 1
Poster: 2
Time: 1:00 PM - 2:45 PM
Mentor(s): Steve van Nocker (Horticulture)

Arabidopsis thaliana (Arabidopsis) is a plant widely used in research for plant genetics. The switch from vegetative growth to flowering in Arabidopsis is regulated by two genes: FLC, a transcription factor that suppresses activity of genes that direct flower formation, and VIP4, a regulator of FLC. The mechanism by which VIP4 regulates FLC is not known. To gain insight into this mechanism, we carried out a specialized genetic screen, called a suppressor screen, to discover mutations that suppress the abnormal FLC expression associated with a mutation in vip4. A suppressor screen is a tool used to identify genes that can revert the phenotype of an original mutation. A late-flowering mutant was observed in our screen and a single mutation in the gene UP FRAMESHIFT 2 (UPF2) was identified. UPF2 is a primary component of nonsense-mediated mRNA decay, which is a RNA quality surveillance mechanism. Now we are using genetic and genomic approaches to determine the mechanism by which loss of UPF2 suppresses abnormal FLC activity.

TESTING THE LIFE HISTORY THEORY PREDICTIONS A OF TRADE-OFF BETWEEN REPRODUCTIVE RATE AND LIFE SPAN IN YEAST

Shante Hutchinson
Home Institution: North Carolina Agricultural and Technical State University
Category: Agriculture and Animal Science, Section 1
Poster: 3
Time: 1:00 PM - 2:45 PM
Mentor(s): Barry Williams (Zoology)

A major goal in Biology is to understand why organisms live as long as they do. Mutations that increase life span are often found in genetic screens, so the question is: Why don't organisms live longer? Life span increasing mutations are thought to reduce reproductive rate due to the fact that two life history traits are controlled by the same genes; this is known as Antagonistic pleiotropic traits. Antagonistic pleiotropy in yeast affects chronological aging and reproduction causing the multicellular organism to have a trade-off. In this study we attempted to determine if a pleiotropic trade-off exists in the Saccharomyces cerevisae (yeast). This will determine whether high reproductive rates shorten the lifespan of yeast. We

hypothesized that once the genetic mutation is detected; yeast will have the ability to abundantly reproduce and the senescence (life span) will remain at the same pace. We isolated the adaptive yeast mutants with higher rate of cellular proliferation under two conditions using one strain of yeast (B454). After validating the Mendelian inheritance of each mutation in the collection, we quantified changes in reproduction rate and chronological aging. Growing mutations; Fluconazole and Sodium Chloride (NaCl) will be used to stress the yeast in order to identify genetic mutations.This research will help identify the molecular genetic mechanisms for the trade-off between reproduction and lifespan in yeast.

EFFECTS OF EXERCISE IN GILTS DURING THE LAST 10 DAYS OF GESTATION ON DYSTOCIA AND PIGLET HEALTH

Alexandria Bufford
Home Institution: Tuskegee University
Category: Agriculture and Animal Science, Section 1
Poster: 4
Time: 1:00 PM - 2:45 PM
Mentor(s): Nathalie Trottier (Animal Science)

In the swine industry, loss of piglets during farrowing (birth) is a big issue, due to dystocia. This can be caused by piglets being too large, the sow's birth canal being too small, or simply the sow's inexperience with delivering piglets. This in turn puts the piglets at risk of being a still born or being born with trauma due to loss of oxygen. 70% of swine farms use a crate system during gestation, which prevents the sows from moving around, instead of a loose housing system which permits more movement. Our main concern is in gilts, which are young sows having their first litter of piglets. Due to their inexperience with delivering piglets our focus in this study is to investigate the effects of exercise during the last 10 days of gestation on dystocia in gilts. With more research in the exercising of sows and the effects on farrowing time and piglet health industry might shift towards a loose housing system to allow for more movement for the sows during gestation. There are 13 sows in the study which are due to farrow between July 11th and July 16th. There will be a control group of gilts with various due dates and a experimental group of gilts that will be exercised with various due dates. Each gilt will be exercised the last 10 days of gestation for 20 minutes each day, twice a day.

SOCIAL COMMUNICATION AND SYNCHRONOUS BEHAVIORS IN HONEY BEES

John Kochiss & Amy Fontaine
Home Institution: Michigan State University, Humboldt University
Category: Agriculture and Animal Science, Section 1
Poster: 5
Time: 1:00 PM - 2:45 PM
Mentor(s): Fred Dyer (Zoology), Kristen Risley (Zoology)

Honeybee foragers communicate to their nest mates the location of food sources though a series of waggle dances. Follower bees that watch these dances must find a way to locate the food sources through the information given to them by the experienced dancers bees. Previous observations suggested that forager bees are able to synchronize their visit to a common resource. This would be displayed by temporal clustering of dances to a common resource and by followers displaying a tendency to switch between these dancers. We have begun to measure this by analyzing video footage of forager dancing.

ANALYSIS OF MUTATIONS IN THE GL1 GENE IN ARABIDOPSIS

Taylor Twombley
Home Institution: JW Sexton High School
Category: Agriculture and Animal Science, Section 1
Poster: 6
Time: 1:00 PM - 2:45 PM
Mentor(s): Steve VanNocker (Horticulture)

In the plant Arabidopsis (Arabidopsis thaliana), the GL1 gene encodes a transcriptional activator. This transcriptional activator is known to direct the formation of trichomes (hairs) on the epidermal surfaces of leaves and stems. Mutated forms of this GL1 gene can cause glabrous plants or severely reduce the number of trichomes. The GL1 mutant alleles are commonly used for phenotypic markers in genetic crosses. The GL1 alleles help identify contaminants for mutant screens. We are trying to determine what type of mutations various gl1 mutants have. To do this we are rough mapping with PCR, fine mapping with restriction enzyme fingerprinting, and direct sequencing. The results of these studies will be presented.

MARGINAL LAND STUDY FOR PROMISING BIOFUEL CROPS
Casey Reagan
Home Institution: Michigan State University
Category: Agriculture and Animal Science, Section 1
Poster: 7
Time: 1:00 PM - 2:45 PM
Mentor(s): Kurt Thelen (Plant & Microbial Sciences)

In the on-going Food vs. Fuel debate, the growing ambition to produce domestic ethanol is conflicting with our resolute need to feed a growing population here in the U.S. and around the world. This marginal land study conducted by both Michigan State University and the University of Wisconsin provides an answer for both sides of the debate. Marginal lands are sites that are deemed unsuitable for growing crops such as corn or soybeans, but will support the growth of biofuel crops, such as miscanthus, switchgrass, or poplar. The study's goal is to determine how well different marginal land sites will sustain these biofuel crops, and will do so by analyzing output and various quality component factors in the final crop. These quality factors include glucan and xylan levels as well as total lignin. A total of six sites, three different sites in both Michigan and Wisconsin, have been planted with 4 repetitions each of miscanthus, switchgrass, and poplar. There are also 4 repetitions at each site devoted to a mix of native prairie grasses and 4 replications of native prairie. Finally, there is also a replicated control check that was left in existing vegetation. As the study is still in the establishment stage, no final data is available for analysis. The study will be valuable in determining which biofuel crops are suitable for growing on marginal soils.

SOIL WATER RETENTION TECHNOLOGY (SWRT)
Samrawi Gebermedhin
Home Institution: Michigan State University
Category: Agriculture and Animal Science, Section 1
Poster: 8
Time: 1:00 PM - 2:45 PM
Mentor(s): Alvin Smucker (Crop, Soil, & Microbial Sciences)

The main objective of this study is to determine the effects of SWRT on plants growth, yield, water use efficiency and the soil. This new technology is currently being tested in Sandy Soil. There are two research field sites and a smaller scale lycemeter. The first research site is being used to test the benefits of SWRT on field crops and the second on cash crops. The lycemeter is being used to observe root growth underneath and wetting and drying cycle of the sand. Many sensors and data loggers have been installed across these fields and also in the lycemeter to help trace the exact movement of water. This is then used to deduce the best methods in which this technology can be used to minimize water and nutrients loss in soils with very low water holding capacity like Sand. From the data collected last year the SWRT plots showed a drastic increase in yield compared to the controls. The Water content of the soil on the SWRT plots were also substantially higher throughout the season. Soil samples collected at the end of the season also showed that the plots with the SWRT membranes were found to have more concentration of nutrients. This technology can help convert dry empty Sand Pits to very fertile and efficient farming lands which use less water and nutrients.

BIOCHEMISTRY & MICROBIOLOGY

DOES AGING AFFECT K+-INDUCED DILATION OF RESISTANCE ARTERIES FROM C57BL-6 MICE?
Jessica Pettis
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 1
Poster: 10
Time: 1:00 PM - 2:45 PM
Mentor(s): William Jackson (Pharmacology & Toxicology)

Myogenic tone of smooth muscle cells in small arteries regulates tissue blood flow and contributes to the regulation of blood pressure. Skeletal muscle blood flow regulation is impaired with aging. Elevated extracellular K+ has been proposed to mediate vasodilation during exercise. We hypothesized that aging would reduce resistance artery dilation to elevated extracellular K+. We dissected arteries from abdominal muscles from young (3 months) or aged (24 months) mice, and transferred them to a cannulation chamber. The arteries were cannulated with micropipettes and tied with nylon monofilament sutures. Vessels were imaged using an inverted microscope coupled to a video camera. Vessels were pressurized to 80 cm H2O and the internal diameters were measured before and during exposure to 15 mM K+ solutions. Maximal diameters were assessed by exposing the arteries to solutions containing 0 mM Ca2+. We found that the maximum diameter of the arteries were not significantly different in young (179 ± 13 μm) and aged (156 ± 6 μm) mice (n=3). Myogenic tone (young = 15 ± 4% vs. aged = 20 ± 9%) and dilation in response to K+ (young = 50 ± 9% vs. aged = 76 ± 9%) were also similar between vessels from young and aged mice. Our preliminary results contradict our initial hypothesis that K+-induced dilation is impaired in aged mice. Student Support: NIH grant R25-HL103156 Research Support: NIH Grant HL086483

BICALUTAMIDE AS AN EFFECTIVE PERIPHERAL ANDROGEN RECEPTOR ANTAGONIST IN CAPSULE AND INJECTION FORM

Bethany Grysko
Home Institution: Northern Michigan University
Category: Biochemistry & Microbiology, Section 1
Poster: 11
Time: 1:00 PM - 2:45 PM
Mentor(s): Katherine Halievski (Neuroscience), Cynthia Jordan (Neuroscience)

Androgen-dependent diseases, such as prostate cancer, are often treated with androgen receptor(AR) antagonists. Effective treatments only require blocking AR activity in the periphery. However, some AR antagonists cross the blood brain barrier, and block the positive effects of AR activity in the brain, such as stress reduction. The AR antagonist bicalutamide has been observed to have poor penetration of the blood brain barrier. Evidence suggesting that mutant ARs act in skeletal muscle to cause spinal bulbar muscular atrophy (SBMA), an androgen-dependent neurodegenerative disease, leads us to consider bicalutamide as a treatment option. Bicalutamide is typically introduced via injection or oral gavage, which causes stress to the subject. Bicalutamide-filled capsules offer a less invasive method of experimental administration. First, we established bicalutamide's antagonistic effects on AR in peripheral organs. Adult wild-type male mice were injected subcutaneously with 10mg/kg bicalutamide dissolved in vehicle (DMSO/PBS;1:1) or just the vehicle for 10 days. Our findings indicate that seminal vesicle weights in gonadally intact mice treated with bicalutamide are similar to castrated mice treated with the vehicle. Testosterone levels of gonadally intact males did not differ regardless of treatment with bicalutamide or the vehicle, suggesting that bicalutamide is not acting in the brain to block the AR involvement in the negative feedback control of circulating androgens. Next, we compared the effectiveness of bicalutamide-filled silastic capsules inserted subcutaneously (6mm and 3mm effective release lengths; inner diameter=1.57mm; outer diameter=3.18mm) compared to injections. This improved administration technique could positively influence studies on progression and treatments of SBMA.

DIAGNOSING HYPOLACTASIA BY GENOTYPING MCM6 GENE SNP C/T-13910 IN HUMAN IB3-1 CELL LINES VIA ALLELE SPECIFIC PCR

Hassan Fadel
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 1
Poster: 12
Time: 1:00 PM - 2:45 PM
Mentor(s): Douglas Luckie (Physiology)

The C/T-13910 mutation on the MCM6 gene is the root cause of the persistence of lactase-phlorizin hydrolase (LCT) gene expression (Bulhões et al, 2007). The C/T-13910 mutation involves a single cytosine to thymine base pair substitution 13,910 base pairs upstream of the LCT gene, in intron 13 (Enattah et al, 2002). The presence of the mutation causes lactose persistence in up to 97% of adult cases (Bulhões et al, 2007). The purpose of our research was to successfully develop a cost effective method to diagnose hypolactasia. Allele specific PCR was conducted in order to properly genotype human IB3-1 cell lines. The PCR results were used to determine whether samples of DNA were wild type, heterozygous, or homozygous for the C/T-13910 mutation. Two forward primers (FWTPrimer/FMTPrimer), and one reverse primer (Rprimer), were created to anneal to either mutant or wild-type DNA. Gel electrophoresis was used to analyze the amplified DNA to identify the presence of C/T-13910. FWTPrimer and FMTPrimer were predicted to yield a single band of 1106 base pairs for homozygous genotypes depending if sample was CC or TT. Heterozygous DNA was predicted to show a segment of DNA 1106 base pairs long for both primers, due to a CT genotype (Bulhões et al, 2007). The assay was unsuccessful due to lack of mutant DNA availability and unsuccessful custom primers. Only wild type DNA was used in the assay and no bands were produced when ran through PCR with both FWTprimer and FMTprimer.

SPONTANEOUS HYPERTENSIVE STROKE PRONE RATS TESTING VASCULAR COGNITIVE IMPAIRMENT ACROSS VARIED AGES.

Guillermo Moreno
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 1
Poster: 13
Time: 1:00 PM - 2:45 PM
Mentor(s): Anne Dorrance (Pharmacology & Toxicology)

The carotid arteries supply 80% of oxygenated blood to the head and neck in humans. Damage to these arteries could lead to a reduction of blood flow an induce stroke. Stroke has been associated with Vascular Cognitive Impairment. (VCI). The Spontaneously Hypertensive Stroke Prone Rat (SHR&SP) is the strain that has been used to investigate brain damage, short-term memory loss, and treatments for it. We hypothesize that SHR-SP strain will become more cognitively impaired with increased age and this will associated with decreased dilation in the carotid arteries. Blood loss correlation to VCI has been observed in both humans and the SHR&SP strain. This study will also be testing the cognitive impairment of the strain by the

elevated cross maze and the novel object test. A control of normotensive Wistar Kyoto (WKY) rats will be used for comparison. The purpose of this experiment is to study the vascular reactivity of the carotid artery on the SHR-SP strain at different ages when incubated with L-NAME. The strain will be tested for concentrations from 10-7M to 10-2M of Acetylcholine (ACh), incubated with 10-2M of L-NG-Nitroarginine Methyl Ester (L-NAME) among ages. Studies suggest that this is a suitable model for Vascular Brain Disorder (VBD). We will also examine the force of constriction of vascular tissues incubated with ACh & L-NAME. We will assess the involvement of Nitric Oxide in the cognitive decline as well as state that these tissues will contract more than SHR-SP tissues without incubation as means of hypertensive regulation.

THE ROLE OF HYPOXIA-INDUCIBLE FACTOR 1α IN THE EXPRESSION AND SECRETION OF CYTOKINES BY ALVEOLAR TYPE II CELLS AND MACROPHAGES FOLLOWING COBALT EXPOSURE

Ricardo Rivera-Soto
Home Institution: University of Puerto Rico at Arecibo
Category: Biochemistry & Microbiology, Section 1
Poster: 14
Time: 1:00 PM - 2:45 PM
Mentor(s): John J. LaPres (Biochemistry & Molecular Biology)

Asthma is a chronic inflammation of the airways that affects approximately 22 million Americans and the symptoms include cough, eosinophilia, and shortness of breath. This disease is characterized by an immunological response mediated by T-helper 2 (Th2) cytokines. Recent studies have shown that mice deficient in the protein hypoxia inducible factor 1 alpha (HIF-1α) and exposed to cobalt exhibit an asthma-like immune response, including eosinophilia and Th2 cytokine expression. In contrast, control mice respond to cobalt by displaying symptoms similar to hard metal lung diseases, including neutrophilia and Th1 cytokine expression. However, we still do not know how loss of HIF-1α mediates this change in inflammation. Previous research in the laboratory and literature review have led us to hypothesize that loss of HIF-1α in alveolar type II (ATII) cells lead to a change in the cell's cytokine expression profile and these cytokines alter the function of macrophages. To address this hypothesis, A549 cells, a human ATII-like cell line, will be used. To model what happens in the transgenic mouse lung, these cells will be manipulated, using siRNA, to express less HIF-1α. Following successful knock down, these cells, and their respective controls will be exposed to cobalt and the expression of various inflammatory mediators genes will be assessed using quantitative RTPCR. These cytokines can act as messengers to macrophages. Therefore, we will also coculture our A549 cell strains with a macrophages cell lines to evaluate their response to the stimulation by the cobalt-induced ATII cytokines.

PROFILING ACYLSUGAR ACCUMULATION IN TOMATOES USING LIQUID CHROMATOGRAPHY-MASS SPECTROMETRY

Katherine Moeller
Home Institution: St. Olaf College
Category: Biochemistry & Microbiology, Section 1
Poster: 15
Time: 1:00 PM - 2:45 PM
Mentor(s): A. Daniel Jones (Biochemistry & Molecular Biology)

Acylsugars are specialized metabolites that accumulate in glandular trichomes. These chemicals play an important role in protecting plants of the genus Solanum from insects. Greater understanding of acylsugar biosynthesis may lead to new knowledge regarding how species gain (and lose) biosynthetic pathways that are not present in other related species. In order to understand these pathways, the metabolites, in this case acylsugars, are identified and quantified at various stages of plant development. Profiling of acylsugars from tomato seedlings (S. lycopersicum M82) using liquid chromatography-mass spectrometry (LC-MS) revealed a previously undetected acylsugar dectected as a negative ion of mass/charge (m/z) - 793.423. To purify this compound for structure elucidation, an HPLC method was created for preparative liquid chromatography. The structure is being established using two-dimensional NMR spectroscopy. From mass spectrometry results, it is expected that the metabolite is an acylsucrose that contains a twelve-carbon acyl chain based on a fragment of m/z 199.2 in the spectrum. To study the fluctuation of acylsugars throughout seedling development, acylsugars and the two precursors, amino acids and sucrose, are extracted daily from M82 and two S. pennellii introgression lines (IL 5-3 and IL 11-3) and quantified using LC-MS. Changes in quantities of each of these metabolites are providing a better understanding of the dynamics of acylsugar accumulation and the roles of genes on specific regions of chromosomes 5 and 11. The results will allow for a better understanding of how tomato and its relatives adapt under pressures from insect herbivores.

METABOLIC FLUX ANALYSIS OF MAIZE EMBRYOS

Elizabeth Chatt
Home Institution: University of Wisconsin-River Falls
Category: Biochemistry & Microbiology, Section 1
Poster: 16
Time: 1:00 PM - 2:45 PM
Mentor(s): Rebecca Roussey (Plant Biology)

Metabolic flux analysis is utilized to gain insight into the regulation and control of substrates through a subset of metabolic pathways in a complete network. Metabolic flux analysis can be utilized to distinguish differences between phenotypically similar plants such as hybrids, inbred lines, and transgenic plants with different sites of construct insertion. Examining the metabolism of specific tissue from a transgenic plant can identify the effects of a transgene on the tissue and determine where the transgene is expressed. This study utilized a steady-state labeling approach as a means of simplifying the complex metabolism of maize embryos, which includes storage pools, multiple location sites for a single reaction, bidirectional fluxes, and substrate cycling (Ratcliffe, R.G. and Shachar-Hill, Y.,2006). Young maize embryos were excised from kernels and cultured on different defined media with or without 13C labeled glucose. After a growth period in culture, the CO2 produced and biomass (oils, solubles, proteins, starch, and cell wall) were quantified. A variety of methods were used for quantification of the CO2 produced and the biomass as well as for substrate labeling analysis. These methods included GC-FID, GC-MS, NMR, and enzymatic testing. The resulting flux and labeling data for each maize line was then analyzed with Principal Component Analysis (PCA) to predict metabolic variations between lines before completing individual flux models.

INTERACTIONS BETWEEN TGF-BETA PROTEINS

Jalen Adams
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 2
Poster: 18
Time: 1:00 PM - 2:45 PM
Mentor(s): Erik Martinez-Hackert (Biochemistry & Molecular Biology)

The NODAL gene plays a key role in a number of processes during embryogenesis, including cell growth, cell differentiation, and apoptosis. However, there are also major medical implications associated with the NODAL-gene (NDG). Because NDG is often over-expressed in many people, it can turn on unnecessary or unwanted cellular growth, hence its connection to certain forms of cancer. The Nodal protein, coded by the NODAL-gene, belongs to the Transforming Growth Factor (TGF-Beta) family of proteins. Studies have found that this protein plays a large role in the reproduction and regulation of stem cells in developing endoderm. Problems begin to occur when the NODAL-gene is re-activated after endoderm development, inducing the onset of cancer. Our goal is to create a molecular interaction map of the TGF-Beta signaling pathway, with an emphasis on Nodal. Understanding of this pathway will allow the development of inhibitors for use in medications and cancer treatments. My research methods consist primarily of the purification of TGF-Beta proteins. This will allow for the study of these proteins individually in controlled environments. Standard techniques such as dialysis, gel electrophoresis, and affinity chromatography will be used. Other methods, such as ammonium sulfate precipitation and protease tests, will be implemented based on the protein being studied. Once these proteins have been purified, they will be tested against the Nodal protein to see if they interact. The specifics of how they interact and the results of these interactions will be covered in future research.

CHARACTERIZATION OF THE NOVEL PROTEIN HP4 AND ITS FUNCTION IN PLANT GROWTH

Desiree Dubose
Home Institution: Norfolk State University
Category: Biochemistry & Microbiology, Section 2
Poster: 19
Time: 1:00 PM - 2:45 PM
Mentor(s): Susanne Hoffman-Benning (Biochemistry), Jie Li (Biochemistry)

The cell wall and cuticle play an important role in cell and organ growth. Their composition aids in the extent and direction of the growth of plants. Evidence shows that the epidermis is identified as a mechanism to restrict and aid expansion growth. We used auxin to induce growth in corn coleoptiles sections to better understand the rapid cell elongation. 15 of 86 proteins we identified were predicted to be related to the secretory pathway, cell wall, or cutin biosynthesis, and, thus, could play a role in cell expansion growth. We compared the expression of two newly identified hypothetical proteins (HP3 and HP4) to that of several of the known cell wall biosynthesis proteins. Expression of both genes is correlated with expansion growth in coleoptiles and leaves. However, while HP3 expression appears to be predominant in the epidermis, HP4 is equally expressed in inner tissues. My work focuses on understanding the unknown function of the novel HP4 protein. The confocal microscopy technique was used to transitionally express the GFP fused HP4 protein in the tobacco leaf and locate the protein on the subcellular level. Our preliminary data suggest that HP4 may be present in the cytosol and nucleus which means it could possibly function through pathway signaling. We are currently analyzing the phenotype of the HP4 homolog knock out mutant and HP4 overexpressing line in Arabidopsis seedlings and adult plants. The final data regarding the phenotype will be presented.

NEUROTENSIN NEURONS IN THE LATERAL HYPOTHALAMIC AREA PROJECT TO THE VENTRAL TEGMENTAL AREA: A NOVEL NEURAL CIRCUIT TO MODULATE ENERGY BALANCE

Janaan Meyers
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 2
Poster: 20
Time: 1:00 PM - 2:45 PM
Mentor(s): Gina Leinninger (Physiology)

To maintain survival the brain must coordinate energy cues with goal directed behaviors to modify energy intake. This includes promoting food seeking when energy reserves are low (fasting) or attenuating feeding when they are high (during energy repletion or obesity). Neurons in the lateral hypothalamic area (LHA) are important coordinators of energy balance and behavior via their innervation of the Ventral Tegmental Area (VTA), a brain area that regulates locomotor activity and the incentivized intake of food. For example, LHA Orexin neurons are activated during fasting to promote alertness and food intake. We identified a large group of non-Orexin LHA neurons that contain Neurotensin (Nts) and innervate the VTA: we therefore hypothesized that LHA Nts neurons might also regulate energy intake. Some LHA Nts neurons express the long form of the leptin receptor (LepRb) and are activated by leptin, a signal of energy excess: we refer to these as NtsLepRb neurons. We therefore examined whether these NtsLepRb neurons specifically project to and regulate the VTA. Our data reveal populations of LHA Nts neurons that are regulated by energy balance stimuli (including leptin) and which are poised to coordinate energy balance cues and motivated behaviors.

FUNCTIONAL COMPLEMENTATION OF CYANOBACTERIAL PHYCOERYTHROBILIN BIOSYNTHESIS WITH A CYANOPHAGE GENE IN THE CYANOBACTERIUM FREMYELLA DIPLOSIPHON

Kemi Akinrimisi
Home Institution: Morgan State University
Category: Biochemistry & Microbiology, Section 2
Poster: 21
Time: 1:00 PM - 2:45 PM
Mentor(s): Andrea Busch (Plant Biology)

Fremyella diplosiphon is a freshwater cyanobacterium that can change its pigmentation due to light quality, a process referred to as complementary chromatic adaptation (CCA). During CCA the light harvesting antennae, called phycobilisomes (PBS), are restructured in response to green light and red light. The PBS is composed of phycobiliproteins with a covalently attached phycobilin chromophore that gives them their specific absorption characteristics. In red light the main phycobiliprotein is phycocyanin and the cells appear green. In green light the main light-harvesting pigment is phycoerythrin (PE) and the cells appear red. The major phycobilin chromophore attached to PE is the pink-colored phycoerythrobilin (PEB). PEB biosynthesis in cyanobacteria requires two enzymes, i.e., 15, 16 dihydrobiliverdin: ferredoxin oxidoreductase (PebA) and phycoerythrobilin: ferredoxin oxidoreductase (PebB). These two enzymes are encoded in an operon called pebAB. A cyanobacteria-infecting virus (cyanophage) carries a gene for a functional enzyme that can carry out the same two reactions to form PEB and this enzyme is called phycoerythrobilin synthase (PebS) . The main focus of this project is to find out if the cyanophage enzyme can fully complement a mutant lacking the cyanobacterial genes needed for biosynthesis of PEB in F. diplosiphon. This will be done by exchanging pebS for pebAB through homologous recombination in the genome of F. diplosiphon. In a second approach, a △pebAB knock out mutant has been generated in F. diplosiphon that will be complemented by transformation with a plasmid carrying pebS under the control of the pebAB promoter.

ROLE OF HYPOXIA-INDUCIBLE FACTOR (HIF)-2ALPHA ACTIVATION IN HEPATIC STELLATE CELLS IN LIVER INFLAMMATION AND MATRIX DEPOSITION AFTER LIVER INJURY

Yingli He
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 2
Poster: 22
Time: 1:00 PM - 2:45 PM
Mentor(s): Bryan Copple (Pharmacology & Toxicology), Elahé Crockett (Medicine)

Background: Hypoxia-inducible factors (HIFs) are a group of transcription factors activated in hypoxic cells. Once activated, these transcription factors regulate expression of genes involved in glycolysis, cell survival, proliferation, erythropoiesis and angiogenesis. HIF-1alpha promotes glucose consumption and glycolysis, whereas HIF-2alpha promotes tissue repair. We previously showed HIF-1alpha knockout in hepatic stellate cells (HSCs) in the liver decreased inflammation and increased matrix deposition after treatment of mice with the hepatotoxicant, carbon tetrachloride (CCl4). In this study, we tested the hypothesis that knocking out HIF-2alpha in HSCs also affects inflammation and matrix deposition upon CCl4 treatment.
Methods/Results: HSC-specific HIF-2alpha knockout and control mice were pre-treated with CCl4 for 96-hours. To selectively knock out HIF-2alpha in HSCs, HIF-2alpha floxed mice were crossed with mice that express Cre recombinase under control of the glial fibrillary acidic protein promoter that is expressed in HSCs. Pre-treatment of control mice with

normal HIF-2alpha protein levels in HSCs increased mRNA levels of inflammatory mediators, including TNF-alpha, MIP-2, KC, IL-6 and PAI-1, and levels of matrix mediators, including type-I collagen, type-III collagen and alpha smooth muscle actin. Pre-treatment of HSC-specific HIF-2alpha knockout mice with CCl4 increased levels of all of these genes to a similar extent, indicating HIF-2alpha is not required for inflammation and matrix deposition 96 hours after CCl4 treatment. **Conclusions:** Although HIF-1alpha activation in HSCs is important for liver inflammation and matrix deposition after liver injury, HIF-2alpha is not. **Support:** Y.H. is a REPID scholar with training support from an NIH-award to Elahé Crockett, REPID Program Director.

DEVELOPING INNOVATIVE METHODS FOR RESEARCHING MITOCHONDRIAL METABOLISM

Paul Garza
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 2
Poster: 23
Time: 1:00 PM - 2:45 PM
Mentor(s): Julia Busik (Physiology & Osteopathic Medicine), Elahé Crockett (Medicine), Denis Proshlyakov (Chemistry)

Mitochondria are incredibly complex cellular organelles often dubbed the “powerhouse of the cell” for the many biochemical reactions that take place to produce ATP, the universal energy currency of living things. Current electrochemical methods of studying mitochondrial metabolism are very crude and limited. We are developing more advanced methods that will supersede older models. For this project, under the direction of Dr. Denis Proshlyakov and co-mentors, we hypothesize that a new bio-catalytic electrode, in the development stage, will take sub-mitochondrial proteins, such as Glycerol-3-Phosphate-Dehydrogenase (GPDH), and allow researchers to electrochemically communicate with mitochondria. The development of a GPDH-m electrode is being targeted from different iterative directions including, altered sub-mitochondrial particle isolations rich in purity and quantity, electrochemical characterization and manipulation of GPDH-m via possible electron mediators. A GPDH-m electrode would benefit the scientific community by bestowing upon it an instrument that would offer greater efficiency in studying mitochondria because of the need for smaller volumes and quantity of mitochondria. It would further allow researchers to garner information about how certain biochemical interactions function and aid in identifying molecular bottlenecks that could be associated with certain diseases. **Support:** P.G. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

INVESTIGATION OF NOVEL SMALL MOLECULES FOR BIOFILM INHIBITION

Melanie Callaghan
Home Institution: Johns Hopkins University
Category: Biochemistry & Microbiology, Section 3
Poster: 24
Time: 1:00 PM - 2:45 PM
Mentor(s): Christopher Waters (Microbiology & Molecular Genetics)

Biofilms are communities of microorganisms attached to a surface and embedded in a matrix of exopolymeric substances (EPS). Biofilms are implicated in a diverse array of chronic diseases such as dental caries, periodontitis and chronic wounds as well as implanted device infections. Bacteria living in biofilms can be more than 1000 times more resistant to antimicrobials as a result of low metabolism and the protection provided by the EPS, therefore the development of antibiofilm compounds may represent an important advancement in controlling several medical conditions. The Waters lab has identified and tested an antibiofilm small molecule named antibiofilm compound 1 (ABC-1) that successfully inhibits biofilm formation without inhibiting bacterial growth in Vibrio cholerae. The mechanisms by which ABC-1 acts have yet to be characterized. The goal of this project is to test the effectiveness of nine compounds that have been derived based on the structure of ABC-1 in inhibiting biofilm formation in Vibrio cholerae. Furthermore, it aims to identify genes that may be involved in the bacterial response to ABC-1 and its derivatives by sequencing mutant ABC-1 resistant V. cholerae. In order to test these compounds, V. cholerae biofilms will be grown using the MBECTM assay in the presence of each derivative at varying concentrations, crystal violet stained, and quantified using spectroscopy. The development of antibiofilm compounds such as ABC-1 and its derivatives, and the understanding of their mode of action, may result in novel therapies to treat recalcitrant biofilm infections.

LOCALIZATION OF SIRT3 IN THE ENTERIC NERVOUS SYSTEM IN HEALTH AND DISEASE

Wilmarie Morales-Soto
Home Institution: University of Puerto Rico at Cayey
Category: Biochemistry & Microbiology, Section 3
Poster: 25
Time: 1:00 PM - 2:45 PM
Mentor(s): Brian Gulbransen (Physiology)

Oxidative stress contributes to the development of inflammatory bowel disease (IBD). Increased production of reactive oxygen species and decreased antioxidant defenses contribute to disease pathology in both humans and animal models of IBD. Oxidative stress promotes the death of enteric neurons, leading to permanent gut dysfunction, but the mechanisms that

render enteric neurons susceptible to oxidative stress are unknown. Sirtuin3 is a novel mitochondrial protein that plays an important role in antioxidant defenses. Sirtuin3 expression is high in nervous tissue and visceral organs so we hypothesized that Sirtuin3 is expressed by enteric neurons and that deregulation of Sirtuin3 expression is associated with intestinal disease. We tested our hypothesis by localizing Sirtuin3 in the enteric nervous system of healthy and diseased mice. We used fluorescence immunohistochemistry to assess Sirtuin3 expression in the myenteric plexus of the colon of control and DNBS-colitis mice. Dual-labeling of Sirtuin3 with the pan-enteric neuron marker Hu and enteric neuron subtype markers neuronal nitric oxide synthase (nNOS) and Calretinin was performed to determine the extent of Sirtuin3 expression in the enteric nervous system. We find that Sirtuin3 is highly expressed in the enteric nervous system, and that it co-localizes with both Calretnin and nNOS.

DEVELOPMENT OF AUTOMATED MIXING SYSTEM FOR MEASUREMENT OF PROTEIN INTRAMOLECULAR DIFFUSION

Kevin Jock
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 3
Poster: 26
Time: 1:00 PM - 2:45 PM
Mentor(s): Lisa Lapidus (Physics - Astronomy)

Misfolded proteins cause major problems in the body. As proteins unfold they occasionally expose their hydrophobic amino acids and bond to other unfolded hydrophobic amino acids of proteins. The clustering of these unfolded proteins (aggregation) cause major problems in the human body (i.e. Parkinson's, Alzheimer's, prion disease). The objective of this paper is to investigate the rate of intramolecular diffusion in unfolded proteins. We measure diffusion by measuring the lifetime of the tryptophan triplet state, which is quenched upon contact with cysteine within the same protein chain. These measurements are done at a variety of solution conditions and with aggregation inhibitors. This project will develop a three-pump-syringe system to dispense three different solutions so we can accurately gauge the mixture concentration. This three-pump system will also allow us to perform a given procedure, rapidly and repeatedly. Each of the three pumps will dispense a different solution: a protein and inhibitor, a buffer, and a buffer and sucrose. The three-pump system's custom interface allows for a variety of uses. We will use these data to measure the effects of different inhibitors to determine the most effective way to inhibit aggregation in protein.

EFFECTS OF LIPOPOLYSACCHARIDE STIMULATION IN B-ARRESTIN-1 OVEREXPRESSED SW480 EPITHELIAL CELLS

Rolando Barajas
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 3
Poster: 27
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), Taehyung Lee (Physiology), Narayanan Parameswaran (Physiology)

Background: Dr. Narayanan Parameswaran's lab is focusing on the biochemical and cellular mechanisms involved in the pathogenesis of inflammatory diseases, specifically studying arrestins and G-protein coupled receptor kinases. Previous articles from Dr. Parameswaran's lab have shown important roles that these proteins have in the pathogenesis of colitis and sepsis. In mice models, those with the β-arrestin-1 knockout gene have a significantly weakened inflammatory response to colitis than the wild type mice that expressed the gene. My research is focused on Beta-arrestin-1, primarily the effects of Lipopolysaccharide (LPS) stimulation in SW480 cells (in vitro) when β-Arrestin-1 is overexpressed in these cells.
Methods/Results: The sw480 cell line was transfected with β-arrestin-1 plasmid using Fugene 6 transfection protocol to transfect the SW480 cells. Overexpression was significantly observed thorough a western blot protocol. Although overexpression was observed further transfection with different amounts of plasmid will be done to observe any changes in the effects of LPS stimulation. Stimulation of SW480 cells will be done in increments of time in order to view the differential effects that LPS has on growing transfected cells. These differences will be quantified by RNA isolation, cDNA preparation, and qPCR for inflammatory genes to gain a better understanding of the β-arrestin-1 pathway the pathogenesis of inflammatory diseases. **Support:** R.B. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

CONTRIBUTION OF VOLTAGE-GATED CALCIUM CHANNELS TO NEUROMUSCULAR TRANSMISSION IN THE MOUSE ILEUM

Orlando Vargas
Home Institution: University of Puerto Rico at Arecibo
Category: Biochemistry & Microbiology, Section 3
Poster: 28
Time: 1:00 PM - 2:45 PM
Mentor(s): James Galligan (Neuroscience), Eileen Rodriguez-Tapia (Neuroscience)

Contraction and relaxation of the intestines are generated by a neuronal circuit located in the enteric nervous system. Our

study focuses on the activity of enteric motor neurons, specifically on the contribution of different subtypes of voltage-gated Ca2+ channels (VGCC) to release of neurotransmitters. We want to investigate what is the functional relevance of R- and P/Q-type VGCC in enteric neuromusclular transmission. To do this we are using mice lacking the R-type VGCC (R-type knockout) and tottering mice (missense mutation in P/Q-type VGCC). Mechanical responses of the mouse small intestine in response to electrical field stimulation (EFS; Train 10s, 60V, Pulse duration 0.5ms, 2-16 Hz) are being studied using and in vitro organ bath system and an isometric force transducer. The identity of the neurotransmitters mediating the EFS-induced responses is investigated using pharmacological treatments: scopolamine (1 μM), CP-96,345-1 (0.3 μM), Nitro ω L-arginine (NLA; 100 μM), MRS 2179 (10 μM), and tetrodotoxin (TTX; 0.3 μM). EFS-induced responses of the small intestine consist of a relaxation followed by a contraction. Contraction responses are neurogenic since they are abolished by TTX. However, relaxation responses are not neurogenic since are resistant to TTX block. Scopolamine decreased the contraction produced only by lower frequencies. CP 96,345-1 decrease the contraction produced at all frequencies. The relaxation component of the response was bigger in the presence of both scopolamine and CP 96,345-1. This relaxation was inhibited by NLA and MRS 2179 treatment.

PDE-BASED METHOD FOR IMAGE PROCESSING

Rinaldi Romulus
Home Institution: New York City College of Technology
Category: Biochemistry & Microbiology, Section 3
Poster: 29
Time: 1:00 PM - 2:45 PM
Mentor(s): Guowei Wei (Mathematics)

Research Question: How can we remove noise from an image using high-order-partial-differential-based methods without significantly altering the image edge, quality and visual effects? Image processing is an intelligent and concise summary of the contents of images. Several techniques are used to obtain 2D or 3D images. One of them is cryo-EM. Very often, the image or picture that we obtain is contaminated by noise. Image denoising is one of the main problems in image processing. Several methods have been used to solve this problem. One of them, partial-differential-equation-based method has led to successful result. The object of my summer research is to work on Professor Wei's high-order geometric partial differential equations and algorithm to do noise removal. My work consists of using image data (cryo-EM) from PubMed of proteins and apply Wei's image removal algorithm to polish them, play with the parameters in the algorithm, and possibly effectuate several iterations from the partial differential equations to try to remove noise more efficiently from images.

NON-INVASIVE MRI MEASUREMENT OF VENOUS O2 SATURATION IN SKELETAL MUSCLE

Christian Sebastien Dalencourt
Home Institution: CUNY New York City College of Technology
Category: Biochemistry & Microbiology, Section 4
Poster: 30
Time: 3:15 PM - 5:00 PM
Mentor(s): Ronald Meyer (Biophysical & Science)

Our lab primarily focuses on developing MRI methods for studying skeletal muscle. In this study, we are interested in measuring the amount of oxygen in the veins after extraction by the muscles. An ongoing study shows that it is possible to measure venous O2 content and muscle oxygen consumption during contractions using the dependence of blood transverse relaxation (T2*) on oxygen content. The same study suggested that muscle venous O2 saturation is lower in physically fit and active individuals even when at rest. In other words, this means that active individuals would have less oxygen in their veins. Theoretically, this would suggest that when at rest, the high muscle mitochondrial content in fit people would result in better O2 extraction from the blood. Therefore, the purpose of this study will be to confirm that O2 extraction is higher in the muscles of fit human subjects compared to sedentary human subjects.

WHOLE-CELL BIOCATALYSIS OF ENANTIOPURE β-ARYLALANINES

Chelsea Theisen
Home Institution: Lake Superior State University
Category: Biochemistry & Microbiology, Section 4
Poster: 31
Time: 3:15 PM - 5:00 PM
Mentor(s): R. M. Nishanka Dilini Ratnayake (Chemistry, Biochemistry & Molecular Biology), Kevin D. Walker (Chemistry, Biochemistry & Molecular Biology)

β-Amino acids are important building blocks of many biologically active natural products that are used as pharmaceuticals, nutraceuticals, or pesticides. For example, (3*R*)-β-phenylalanine is the building block of the widely used anticancer natural product Taxol, which is made by *Taxus* plants. By analogy, (3*S*)-β-phenylalanine is the precursor of the antibiotic andrimid, which is biosynthesized in the bacterium *Pantoea agglomerans*. β-Amino acids are generally the central ingredients used to

synthesize non-natural β-peptide antibiotics. These β-peptides disrupt the cell walls of invading microbial organisms and are fortuitously not degraded by commonly occurring bacterial α-peptidases. β-Amino acids can be constructed by synthetic or biocatalytic processes. Compared to synthetic processes, enzymatic biosynthesis is often inherently highly enantioselective, environmentally safer, and potentially more economical.4 In particular, a phenylalanine aminomutase (*Pa*PAM) on the andrimid pathway in *P. agglomerans* is stereospecific for the (2*S*)–α–phenylalanine and stereoselectively converts the (2*S*)–substrate to (3*S*)–β–phenylalanine. Heterologous expression of *Pa*PAM in a host deficient in the andrimid pathway machinery, such as *Escherichia coli*, enables us to use *Pa*PAM as a whole-cell biocatalyst to produce non-natural β–arylalanines. This advantageous approach avoids potentially laborious enzyme purification steps for *in vitro* catalysis, thus reducing the risk of enzyme denaturation. Several variables (temperature, incubation time, cell weight, and substrate concentration) will be tested to optimally produce (3*S*)-β-arylalanine analogs on an industrial scale using *Pa*PAM as a whole-cell biocatalyst.

COMPARING THE EFFECT OF METHYL MERCURY TO CELL DEATH OF DIFFERENTIALLY EXPRESSED $GABA_A$ SUBUNIT IN HEK293 CELLS

Celizbets Colon-Ortiz
Home Institution: University of Puerto Rico at Cayey
Category: Biochemistry & Microbiology, Section 4
Poster: 32
Time: 3:15 PM - 5:00 PM
Mentor(s): William Atchison (Phamacology & Toxicology), Duanghathai Wiwatratana (Phamacology & Toxicology)

The γ-Aminobutyric acid type A receptor ($GABA_AR$) is a heteropentameric receptor consisting of $2\alpha_{1\text{-}6}$: $2\beta_{1\text{-}3}$: and 1 auxiliary subunit (for example, $\gamma_{1\text{-}3}$ or δ) that promotes rapid post-synaptic inhibition, essential for proper nervous electrical balance. Methylmercury (MeHg), a prominent environmental neurotoxicant, has high affinity for the thiol group, found in the cys-loops from the $GABA_AR$ N-terminus. Exposure to MeHg causes neural cell death, but it remains unclear why cerebellar granule cells (CGC) are more susceptible to MeHg than purkinje (PCs) cells in the cerebellum. These cell types express different $GABA_AR$ subunit composition, such as α_1 with γ_2 in PC and α_6 with δ in CGC. These subunits confer markedly different properties to $GABA_AR$. Since cells expressing this α subunits exhibited similar sensitivity to MeHg-induced cytotoxicity, auxiliary subunits (γ_2 and δ) might contribute to the differential effect of MeHg on CGCs and PCs death. To prove this hypothesis, transfected and differentially expressed $GABA_A$ subunit composition in HEK293 cells treated with MeHg were compared within their viability and mortality by acridine orange /propidium iodine (AO/PI) staining. The results indicated the mortality rate of HEK293 cells increases with an increase of both MeHg concentration (0, 1, 2 and 5μM) and exposure period (3 and 6 h). However, the comparison of cell mortality between the $\alpha_6\beta_2\gamma_{2S}$ and $\alpha_6\beta_2\delta$ HEK293 cells yielded a similar mortality rate. Further investigation of other subunit combinations and different cell mortality assay are required to confirm the finding.

POST-TRANSLATIONAL REGULATION OF ISOPRENE SYNTHASE ACTIVITY IN KUDZU

Joshua Allman
Home Institution: Ashland University
Category: Biochemistry & Microbiology, Section 4
Poster: 33
Time: 3:15 PM - 5:00 PM
Mentor(s): Thomas Sharkey (Biochemistry), Sean Weise (Biochemistry)

Isoprene (C5H8) is a small hydrocarbon that appears to confer tolerance to heat fluctuations in plants that emit it. Kudzu (Pueraria lobata) is an introduced invasive species in the southern US known to emit isoprene. Previous experiments in velvet bean have shown that when one leaflet is burned, the adjacent leaflets will release a burst of isoprene. We observed this isoprene burst in kudzu as well. The amount of DMADP, isoprene's immediate precursor in the methylerythritol phosphate pathway, was reduced by half after the burn-induced isoprene burst. This indicates that the burn signal caused increased activity of isoprene synthase. The burn-induced isoprene burst was suppressed when leaves were fed 5 mM EGTA through the transpiration stream. We conclude that calcium signaling is involved in this response.

EFFECTS OF COPPER BIPYRIDINE CATALYZED ALKALINE HYDROGEN PEROXIDE PRETREATMENT ON LIGNOCELLULOSIC BIOMASSES

Sara Adelman
Home Institution: Kalamazoo College
Category: Biochemistry & Microbiology, Section 4
Poster: 34
Time: 3:15 PM - 5:00 PM
Mentor(s): Namita Bansal (Great Lakes Bioenergy Research Center), Eric Hegg (Biochemistry & Molecular Biology)

The primary hindrance to produce fuels from lignocellulosic biomass is its recalcitrant structure, which leads to inefficient enzyme action for the release of sugars. Pretreatment is an important step to break this recalcitrant structure and make

cellulose available for hydrolysis. Various physical, chemical, and biological combinations of pretreatment processes are being explored for the broadening field of biofuels. In the present study five different hardwood biomasses, sugar maple, aspen, silver birch, hybrid poplar DN34, and hybrid poplar NM6 were used. Optimization of copper bipyridine catalyzed alkaline hydrogen peroxide pretreatment conditions and enzymatic hydrolysis are being carried out.

INCREASING ACCUMULATION OF TRIACYLGLYCEROL IN VEGETATIVE TISSUE OF ARABIDOPSIS AND TOBACCO BY EXPRESSING ATWRI1 UNDER CONTROL OF INDUCIBLE PROMOTERS

Ryan Wessendorf
Home Institution: Western Michigan University
Category: Biochemistry & Microbiology, Section 4
Poster: 35
Time: 3:15 PM - 5:00 PM
Mentor(s): Yang Yang (Great Lakes Bioenergy Research Center)

Triacylglycerol (TAG) is a renewable resource found in algae and plants, which can be used for the production of biodiesel. Because plants have high-biomass potential, vegetative tissues of plants, especially leaves, are a promising possibility for biofuel production. Previous research has shown WRI1, a transcription factor, plays an important role in regulating fatty acids biosynthesis in both seeds and seedlings. The seeds of Arabidopsis wri1-1 mutant only contain 20% of TAG, compared to wild type seeds. Overexpression of AtWRI1 led to a 2.6-2.8-fold increase in TAG accumulation in Arabidopsis leaves. In addition, overexpression of WRI1 with co-suppression of APS1 by RNAi, a gene encoding the major catalytic isoform of the small subunit of ADP-glucose pyrophosphorylase, produced an additional 5.8-fold increase of oil in Arabidopsis vegetative tissues than plants overexpressing AtWRI1 or AGPRNAi alone. However, plants from the AGPRNAi-WRI1 transgenic line experienced inhibited development, limiting the applicability of this approach. In this study, we will test the inducible system for expressing AtWRI1. First, AtWRI1 was amplified by using Col-2 wild type cDNA as template, then cloned into ethanol and senescence inducible vectors. The inducible AtWRI1 expression constructs were introduced into tobacco leaves transiently, as well as Arabidopsis by stable transformation. This research will potentially increase TAG accumulation in vegetative tissue, without interfering with plant development.

MASS IDENTIFICATION OF NEW EMERGENT PHENOTYPE GENES AND INVESTIGATION OF PHOTOSYNTHETIC GENES OF UNKNOWN FUNCTIONS IN ARABIDOPSIS THALIANA, BY CHLOROPHYLL FLUORESCENCE SPECTROSCOPY

Samuel Lotz
Home Institution: Slippery Rock University
Category: Biochemistry & Microbiology, Section 5
Poster: 36
Time: 3:15 PM - 5:00 PM
Mentor(s): Jeffrey Cruz (Biochemistry a& Molecular Biology), David Kramer (Biochemistry & Molecular Biology), Linda Savage (Biochemistry & Molecular Biology)

Photosynthesis is the fundamental energy capturing reaction for the majority of life on Earth; a thorough understanding of this process's energy regulation, such as photochemical inputs and excess energy dissipation, is of paramount importance to the management of future energy systems. This study adds to the understanding of photosynthesis in *Arabidopsis thaliana* in two ways: (1) large scale identification of novel photosynthesis related genes with complex emergent phenotypes discernible only under variable and combinatorial environmental conditions, and (2) detailed investigation of mutant photosynthetic functional differences. (1) *A. thaliana* T-DNA knockout mutants and wild-type (Col-0) were imaged, under varying light and temperature conditions, using a chlorophyll fluorescence measuring system for the following photosynthetic parameters: photosystem II (PSII) quantum yield (φ_{II}; i.e. efficiency), non-photochemical quenching (NPQ; i.e. protective energy dissipation), energy dependent quenching (q_E), and inhibitory quenching (q_I). (2) T-DNA Knockout mutants (Loci: At1G67700, At2G29180, At1G18730; unknown, unknown, NDF6 respectively) were chosen from a previous screen for further characterization by the photosynthetic parameters: proton motive force (pmf) around the thylakoid membrane, quantum yield of photosystem I (φ_I), the fraction of open PSII redox reaction centers (q_L), and post-illumination fluorescence (pif) from cyclic-electron flow. Each parameter corresponds to a functional unit within photosynthesis, thus isolating differences in these parameters from the wild type indicates both a mutant phenotype and a presumptive function for the gene.

ANDROGEN RECEPTORS (AR) EXPRESSION AND FIBER COMPOSITION OF SOLEUS AND EDL MUSCLES FROM THE TRANSGENIC MOUSE MODEL 97Q

Laura Vicente
Home Institution: University of Puerto Rico at Cayey
Category: Biochemistry & Microbiology, Section 5
Poster: 37
Time: 3:15 PM - 5:00 PM
Mentor(s): Cynthia Jordan (Neuroscience)

Spinal and bulbar muscular atrophy (SBMA) is an X-linked late-onset motoneuron disease linked to a CAG expansion in exon one of the androgen receptor (AR) gene. Recent studies suggest that motor dysfunction is caused by androgen-dependent cell dysfunction that underlies the loss of motor function in this disease, and that the fast-twitch EDL muscle exhibits a greater disease-related loss in twitch and tetanic force than does the slow-twitch SOL from diseased males in the AR 97 Q transgenic (Tg) mouse model of SBMA. In this study, I set out to determine whether the expression of AR is higher in the EDL than in the SOL which could potentially explain why the EDL loses more contractile force than the SOL in this Tg model. If we find no difference in AR expression, then these results suggest that toxic potential of AR in each muscle depends on fiber type composition or some as yet unknown factor and not on AR expression in muscles. On the other hand, since disease did not affect fiber number but did induce substantial atrophy of EDL muscles, we also propose to determine whether the size of individual EDL fibers is affected by disease. We predict that fibers will on average be smaller in diseased muscle and may also show a greater range of sizes than normal as is typical of muscles affected by motoneuron disease. Results on mouse models of SBMA suggest that primary muscle dysfunction may underlie the loss of motor function in SBMA.

NEUROTENSIN NEURONS IN THE LATERAL HYPOTHALAMIC AREA PROJECT TO THE SUBSTANTIA NIGRA: A NOVEL CIRCUIT OF ENERGY BALANCE AND LOCOMOTIVE BEHAVIOR INTEGRATION?

Lindsey McQuade
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 5
Poster: 38
Time: 3:15 PM - 5:00 PM
Mentor(s): Juliette Brown (Physiology), Gina Leinninger (Physiology)

The physiological mechanisms by which normal energy balance is regulated, and how they may be disrupted in incidents of obesity, remain incompletely understood. Our laboratory is interested in understanding the neuronal networks that coordinate energy balance with appropriate levels of locomotive activity. For instance, excess energy levels initiate an increase in movement to reduce fat stores. We are specifically studying the lateral hypothalamic area (LHA), a region of the brain that receives chemical signals of energy status, such as the adipose-derived hormone leptin, an indicator of energy excess. Neurons within the LHA project to dopamine (DA) neurons in the substantia nigra (SN), a region that regulates locomotor activity. We have identified a collection of LHA neurons that produce the neuropeptide neurotensin (Nts) and are regulated by leptin via leptin receptors (LepRd). Therefore, we hypothesized that LHA neurons may coordinate energy balance cues (leptin) and regulate locomotor activity through communication with the SN. To examine this hypothesis we used mice expressing cre-recombinase in Nts neurons, ensuring the selective identification and investigation of these neurons. The use of retrograde neuronal tract tracer injections into the SN of leptin-stimulated mice identified whether leptin-regulated LHA Nts populations (Nts-LepRd neurons) specifically project to the SN. Thus far, our data suggests the existence of a neuronal circuit between the LHA and the SN that is poised to integrate energy status and locomotor activity.

EFFECT OF CANRENOIC ACID ON ANGIOGENESIS AND MICROGLIAL ACTIVATION IN HYPOPERFUSED RATS

Kristina Savage
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 5
Poster: 39
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Anne Dorrance (Pharmacology & Toxicology), Nusrat Matin (Pharmacology & Toxicology)

Background: Vascular cognitive impairment (VCI) is a disorder that includes a wide range of cognitive impairments caused by various types of cerebrovascular disease. Bilateral carotid artery occlusion (BCAO), is a model of cerebral hypoperfusion that leads to VCI. **Methods/Results:** BCAO was carried out in 20 week old Long Evans rats. VCI was verified using the Morris water maze and novel object recognition test. Because of the limited treatment options available to treat VCI we tested the hypothesis that mineralcorticoid receptor (MR) antagonism with canrenoic acid will prevent VCI. Studies suggest that MR antagonists protect against ischemic injury by promoting the expression of neuroprotective and angiogenic factors as well as remodeling cerebral artery structure to enhance blood flow. Therefore, we propose that canrenoic acid will lead to increased angiogenesis, reduced microglial activation, and improved cognitive function after BCAO. To inhibit mineralcorticoid activation, canrenoic acid was administered to one group of BCAO rats. BCAO reduces blood flow through the carotid arteries and the middle cerebral arteries. Reduced cerebral blood flow has been linked to microglial activation and oxidative stress. To look for evidence of this, brain samples taken from three regions will be stained for endothelial cells and activated microglia. Cognitive function post-BCAO will also be tested as described above. **Support:** K.S. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

FREEDOM OF REPRESSION: CHARACTERIZING RIBOSOME BINDING SITES FOR BICISTRONIC CONSTRUCTS IN SYNECHOCOCCUS PCC 7964

Elizabeth Gall
Home Institution: Tufts University
Category: Biochemistry & Microbiology, Section 5
Poster: 40
Time: 3:15 PM - 5:00 PM
Mentor(s): Daniel Ducat (Biochemistry & Molecular Biology), Adam Jordan (Plant Research Labs)

Heterotrophs and cyanobacteria can be genetically manipulated to produce fuels, plastics, and other materials of industrial or medical utility. Unlike heterotrophs, cyanobacteria require only sunlight and carbon dioxide and can grow in brackish, saline, and otherwise non-arable environments. While many *E. coli* constructs are operable in cyanobacteria, systemic differences between the organisms make the modularity of these parts difficult to predict. Compared to heterotrophs, cyanobacteria are recent targets of biotechnological engineering; few cyanobacterial promoters have been characterized, and it is difficult to predict the molecular interactions that influence cyanobacterial expression of heterologous genes. In *E. coli*, construction of bicistronic operons (in which one promoter controls two genes) permits standardized promoter-gene junctions and reduced nucleic acid secondary structure, allowing reliable expression of heterologous genes regardless of their coding sequences. To investigate this principle in cyanobacteria, we created a library of 15 bicistronic constructs, using cyanobacterial promoters with alternative ribosome binding sites (RBS), which we expect to generate discrete and predictable levels across a wide range of gene expression. We expressed Yellow Fluorescent Protein (YFP) from the constructs so that levels of fluorescence will positively correlate with strength of the RBS. To further control expression, we took advantage of the bicistronic design to introduce repeats of the *E. coli* lac O1 operator both up and downstream of the transcription start site, a design similar to the native lac operon. Together, differential RBSs and operator control should allow tight regulation and predictable expression of heterologous genes in cyanobacteria.

VASCULAR COGNITIVE IMPAIRMENT IN AGED SPONTANEOUSLY HYPERTENSIVE STROKE PRONE RATS

Patricia Perez
Home Institution: University of Puerto Rico at Rio Piedras
Category: Biochemistry & Microbiology, Section 5
Poster: 41
Time: 3:15 PM - 5:00 PM
Mentor(s): Anne Dorrance (Pharmacology & Toxicology)

Carotid arteries are the major blood supply to the brain; about 600-700 ml of blood flows through the carotid arteries every minute. Impaired dilation in these arteries could affect the regulation of cerebral blood flow. The Spontaneously Hypertensive Stroke Prone Rat (SHRSP) was analyzed in this study because recent investigations using the SHR strain have demonstrated that hypertension combined with age, significantly alters cerebrovascular resistance and impairs cerebrovascular activity. The purpose of this experiment is to study the thromboxane U46619 induced contraction and the Acetylcholine (ACh) induced dilation in the carotid arteries from the SHRSP at different ages. We will also test the role played by Cyclooxygenase (COX) metabolites in controlling vascular function by inhibiting COX with Indomethacin. This study will also assess the cognitive impairment of in SHRSP using the elevated cross maze and the novel object test. Control normotensive Wistar Kyoto (WKY) rats will be used for comparison. Two hypotheses are proposed: (1) the SHRSP strain will show an increase in cognitive impairment with increasing age, and (2) COX activity will increase with age, causing Indomethacin to have a greater effect in arteries from aged SHRSP.

SORBITOL LEVELS IN STORED RED BLOOD CELLS

Sam Taylor
Home Institution: Alabama A & M University
Category: Biochemistry & Microbiology, Section 6
Poster: 42
Time: 3:15 PM - 5:00 PM
Mentor(s): Dana Spence (Chemistry)

Red blood cell transfusion is a pivotal component of modern health care. Recently it was discovered that patients receiving blood transfusions have complications associated with INOBA, or Insufficient Nitric Oxide BioAvailability which negatively alters blood circulation. Throughout the blood collection and storage process, red blood cells are exposed to high glucose levels. D-Sorbitol (Sugar Alcohol) is known to accumulate in some tissues in chronic hyperglycemic (high glucose) environments. Since this sugar alcohol isn't easily metabolized it accumulates intracellularly, resulting in hypertonicity and osmotic swelling. We will determine the amount of D-Sorbitol by measuring the fluorescence derived from the NADH formed (Fluorometer: SpectraMax M4). A standard curve was created by plotting the net fluorescence intensities, obtained by subtracting the working standard blank from those of enzymatic reaction, against D-Sorbitol concentrations. Collected blood stored in high glucose solution and low glucose solution will be tested periodically over a 36 day span. The D-Sorbitol levels will then be analyzed and recorded. We predict that the red blood cells stored in the high glucose solution will have

more abundant levels of D-Sorbitol as opposed to the red blood cells stored in the normal glucose levels. We also want to discover if there is an association between abnormal D-Sorbitol levels in red blood cells and their ability to produce and release ATP.

CHARACTERIZATION OF IPMS-LIKE CANDIDATE GENE 230'S ROLE IN ACYL SUGAR CHAIN PRODUCTION THROUGH THE USE OF A YEAST TWO-HYBRID SYSTEM

Christopher Adams
Home Institution: St. Mary's College of Maryland
Category: Biochemistry & Microbiology, Section 6
Poster: 43
Time: 3:15 PM - 5:00 PM
Mentor(s): Jing Ning (Biochemistry & Molecular Biology)

Glandular secreting trichomes are responsible for the production of a wide array of different secondary metabolites in plants, including acyl sugars, which contribute to plant defenses. Different tomato species produce a wide variety of different numbers and lengths of acyl groups attached to acyl sugars. By crossing the cultivated tomato S. lycopersicum cv. M82 and the wild tomato S. pennellii LA0716, chromosomal substitution introgression lines (ILs) are formed, which makes screening for genes that play a role in acyl sugar synthesis possible. In IL8-1, a much higher abundance of iC4 acyl chains, coupled with a decrease in iC5 acyl chains, were found as compared to the cultivated M82 tomato. This phenotype is linked to the leucine-valine biosynthesis pathway, as the acyl chains on acyl sugars are proposed to derive from precursors of branched chain amino acid synthesis. After screening potential genes based on gene localization in the introgressed region and gene function, isopropyl-malate synthase (IPMS)-like gene 230 was determined to be a candidate gene responsible for this discrepancy. This gene is highly similar to IPMS, which plays a key role in the leucine-valine biosynthesis pathway. However, IPMS-like gene 230's mechanism for regulating IPMS activity, which functions as a dimer, is not fully known in tomatoes. A possible mechanism could be that IPMS-like gene 230 forms heterodimers with IPMS and thus inhibits its activity. We generated multiple different gene-vector constructs to be used in the yeast two-hybrid system to characterize the dimerization of IPMS-like gene 230 with IPMS.

OIL BIOSYNTHESIS AT VARYING LIGHT DENSITIES IN CHLAMYDOMONAS REINHARDTII

Bradley Disbrow
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 6
Poster: 44
Time: 3:15 PM - 5:00 PM
Mentor(s): Matthew Juergens (Plant Biology), Yair Shachar-Hill (Plant Biology)

Microalgae have been regarded as a promising feedstock of biodiesel for the transportation fuel industry. While it is well known that microalgae produce large quantities of lipids (including triacylglycerol, which is easily transesterified into biodiesel) when grown under nitrogen starvation, the role that light plays in the biosynthesis of these lipids is poorly understood. Light can provide the energy necessary for the cell to accumulate oil, but it is not known if it is required as a signal. To help clarify the role of light in oil biosynthesis, the CC400 strain of model green microalga Chlamydomonas reinhardtii will be cultured in three light conditions: high light density, very low light density, and complete darkness. Nitrogen-deficient medium will be used to stimulate oil production. C. reinhardtii's growth and physiological change will be characterized, including cell dry weight, lipid mass, biomass, and substrate uptake rates to ascertain the lipid content of each cell. Similar cellular lipid content in high and low light densities, along with low lipid content in light-deprived cells, would indicate that light acts as a signal in oil biosynthesis, while similar lipid content in low-light and dark cells would show that light is not required as a signal for lipid accumulation.

ANALYSIS OF ARRESTIN EXPRESSION IN COLONIC EPITHELIAL CELLS

Brittany Childs
Home Institution: Michigan State University
Category: Biochemistry & Microbiology, Section 6
Poster: 45
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Tae Hyung Lee (Physiology), Narayanan Parameswaran (Physiology)

Background: Narayanan Parameswaran's research lab has been investigating certain cellular and biochemical mechanisms that contribute to inflammatory response. Inflammation is a necessary response that can have both aiding or harmful effects. Studies in Parameswaran's lab are focused on two different protein families, arrestins and G-protein coupled receptor kinases, GRKs. Arrestins are intracellular proteins that are indicated to have an important function in the cell signaling pathways and inflammatory responses. My research project is focused on arrestins role in inflammatory response.
Methods/Results: In my research, I am interested in examining if over-expression of beta-arrestin-1 and -2 will affect inflammatory response in colonic epithelial cell line. Using transfection, agarose gel-electrophoresis, and Western Blot

techniques I will analyze the colonic SW480 cell line. Upon confirmation of over-expression, then ligands such as lipopolysaccharide will be applied to test whether arrestin over-expression affects inflammatory genes such as interleukin-8 in these cells. Research in this field will lead to therapeutic treatments for the harmful effects inflammation can result in such as sepsis and inflammatory bowel disease. **Support:** B.C. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

EFFICACY OF BLH FAMILY PROTEINS IN MANIPULATING THE XYLAN BIOSYNTHETIC PATHWAY

Rachel Polet
Home Institution: Calvin College
Category: Biochemistry & Microbiology, Section 6
Poster: 46
Time: 3:15 PM - 5:00 PM
Mentor(s): Jacob Jensen (Plant Biology), Nathan Johnson (Plant Biology), Curtis Wilkerson (BMB)

The development of biofuels could potentially reduce dependence on foreign oil and the impact of global warming. In order to make the production of biofuels economically feasible, it is important that components of plant cell walls are broken down quickly and easily. A large component of cell walls is hemicellulose, a branching polymer which is thought to help cellulose maintain the plant's structure. Hemicellulose is ubiquitous among plant cell walls and is commonly found in the form of xylan. Manipulating the biosynthetic pathway of xylan could lead to the ability to increase energy density in biofuel crops and improve their digestibility. In order to do this, it essential to understand how different promoters and transcription factors interact. The identity and targets of many master regulators and transcription factors have already been identified but many more are yet unknown. The transcription factor (TF), BLH6, and TF KNAT7 are involved in the expression of the xylan synthesis gene, IRX10. BLH6 belongs to a family of 11 proteins. By testing the rest of the proteins for their ability to work with KNAT7 in the activation of the GH10 promoter, we can hopefully further our understanding of the xylan biosynthetic pathway. Plasmids containing the BLH synthesis genes were created by cloning from cDNA stocks and harvesting plasmids via maxi preps. Protoplasts were be obtained from 3-week-old Arabidopsis plants and transformed with the plasmids. Transactivation assays were then used to determine if the GH10 promoter had been activated.

BIOSYSTEMS & AGRICULTURAL ENGINEERING

EXTRACTION OF E. COLI O157:H7 FROM BROTH USING GOLD COATED IRON OXIDE NANOPARTICLES

Michelle Samalik
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 50
Time: 1:00 PM - 2:45 PM
Mentor(s): Evangelyn C. Alocilja (Biosystems & Agricultural Engineering)

The enterohemorrhagic pathogen *E. coli* O157:H7 is one of the top five bacterial organisms causing food-borne illness in the United States. With the rising problem of food-borne outbreaks, early detection of bacterial contamination is necessary. In the Nano-Biosensor Lab, we develop biosensors to protect the food supply chain. A biosensor is an analytical device that incorporates a biological receptor in close proximity to a transducer. Interaction between the target analyte and the biological receptor is immediately converted into an electronic signal. Our biosensor assay includes two steps: extraction and detection of the target bacteria. This study focuses on developing the extraction method of *E. coli* O157:H7 from different food matrices by using electrically active magnetic nanoparticles, more specifically, magnetic gold (Fe3O4@Au), which are functionalized with specific antibodies (Ab). In the presence of the bacteria, Fe3O4@Au-Ab-bacteria is formed. By applying a simple magnet, Fe3O4@Au-Ab-bacteria is separated from the rest of the sample solution. Synthesis of the Fe3O4@Au nanoparticles begins with the generation of the iron oxide core. The cores are then mixed with gold ions which are then deposited to the surface of Fe3O4 to form Fe3O4@Au. Following the synthesis, protein A is added to the Fe3O4@Au, along with antibodies specific to *E. coli*. This is then used in the extraction of *E. coli* O157:H7 from the sample. Preliminary results indicate that the Fe3O4@Au-Ab is able to capture the target *E. coli* O157:H7 successfully with a capture efficiency of 91.6.

IMPROVING WASTE WATER QUALITY THROUGH COAGULATION AND FLOCCULATION

Hailey E. Dann
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 51
Time: 1:00 PM - 2:45 PM
Mentor(s): Steven I. Safferman (Biosystems & Agricultural Engineering)

Clean water is becoming increasingly scarce. Coupled with the growing need to increase crop production to feed the world, finding, cleaning, and recycling water is becoming more important. Some food processors dispose of waste water by

irrigating crops. Although this beneficially reuses this waste water, the often high levels of nitrogen, phosphorus, bacterial growth, suspended solids, and other contaminants can be harmful to plant growth and pollute the groundwater if not detoxified by the overlaying soil. In order to help negate these possible adverse effects, carbon polymers or metallic salts can be used in the coagulation/flocculation treatment process. This process creates large particles, called flocs, that are conglomerations of nitrogen, phosphorus, metals, sediments, and pathogens that can be potentially separated from the cleaned water. These polymers, however, are often costly and do not work well for all waste water. This project is examining the coagulation/flocculation process of the food processor's waste water using a variety of different metallic salts and polymers. The waste water was first analyzed to determine the starting values of important waste water characterization parameters including turbidity, chemical oxygen demand, total nitrogen, and total phosphorus. These parameters will be examined again after coagulation/flocculation with various concentrations and combinations of polymers and metallic salts.

NANOPARTICLE ENHANCED MEDIA FOR THE RECOVERY OF PHOSPHORUS FROM WASTEWATER

Bethany Swanberg
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 52
Time: 1:00 PM - 2:45 PM
Mentor(s): Steven Safferman (Biosystems Engineering)

High levels of phosphorus in wastewater discharge causes harm to aquatic environments. Phosphorus is also a valuable resource and traditional sources of phosphate are becoming increasingly scarce. This study is an evaluation of a porous, ceramic, nano-enhanced iron-based media that sorbs phosphorus from wastewater and allows for the recovery of that phosphorus as well as reuse of the media. Several columns filled with varying volumes and types of media have been continuously supplied with domestic wastewater. The column influent and effluents are tested weekly to estimate the total sorption of phosphorus by the media. Preliminary results indicate that for a target effluent phosphorus concentration of 1 mg/L media capacity reached 5.4 mg P/g media. However, research is ongoing, and ultimate capacity has been found to be greater than 27.6 mg P/g media. The capacity of this media is considerably higher than currently available phosphorus sorbing media, and results are expected to show that it is a cost-effective way to remove and recover phosphorus from wastewater.

ISOTHERM STUDY OF NANO-ENHANCED PHOSPHORUS SORBING MEDIA

Monica Walker
Home Institution: University of Michigan
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 53
Time: 1:00 PM - 2:45 PM
Mentor(s): Steven Safferman (Biosystems Engineering)

Phosphorus is crucial to developing healthy cells, and for cultivating crops. However, phosphorus is not safe at high levels in watersheds and a major source is from human wastewater. This study will develop an isotherm capacity equation to show the relationship between time, and amount of phosphorus that the porous iron-based media can adsorb. This media, developed and manufactured by MetaMateria, LLC, has properties that allow it to adsorb phosphorus from direct contact with water. The experiment will proceed as follows: different levels of media will be combined together with a large quantity of phosphorus-rich water and shaken constantly over a period of several weeks. Every other day, the levels of phosphorus in the water will be examined, and when the amount of phosphorus stops going down, it will be assumed that the media has reached its adsorption capacity. The data will be graphed in a log-log plot. Having this data will give MetaMateria concrete design data, making the product more useful for real life application. This media will not only improve water quality, but will also harness phosphorus and render it capable for reuse.

ENHANCED ALGAL STARCH PRODUCTION USING TWO STAGE CULTIVATIONS UNDER CO2 RICH CONDITIONS

Danielle Boileau
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 54
Time: 1:00 PM - 2:45 PM
Mentor(s): Wei Liao (Biosystems & Agricultural Engineering), Yan Liu (Biosystems & Agricultural Engineering), Zhenhua Ruan (Biosystems Engineering), Xiaoqing Wang (Biosystems Engineering)

Chlamydomonas reinhardtii, a unicellular green microalga, can store large amount of polysaccharides, mainly starch in the chloroplast under certain culture conditions, which could be used as a prospective feedstock for biofuel production. The rate of starch production is a function of biomass productivity and intracellular starch content. It is well-known that starch accumulation in the microalgae can be achieved mainly by nitrogen starvation. However, cell growth under the nitrogen starvation is much slower than that observed in the complete medium. Hence, compromising between increasing starch

content and cell growth is necessary to achieve high values of both biomass and starch productivities. Therefore the objective of this project is to use a two-stage culture to achieve biomass and starch accumulation in microalgae. The first stage is to generate large amount of cells under nitrogen rich medium and the second stage is to accumulate starch in the cell under nitrogen limited condition. In the first stage, continuous cultures with different dilution rates are conducted in a high salt (HS) medium to achieve the maximum biomass productivity. For the second cultivation stage, the biomass harvested from the continuous culture is cultured in HS medium without nitrogen (HS-N) for the starch accumulation. Growth kinetics under the nitrogen starvation is studied through cell counting and weighing drying biomass, and starch content is analyzed by the combination of hydrothermal pretreatment of biomass with dilute acid and high-pressure liquid chromatography (HPLC).

EVALUATING POPULUS EURAMERICANA CV. 'EUGENEI' AS A BIOENERGY FEEDSTOCK FOR PYROLYSIS

Rachael Sak
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 1
Poster: 55
Time: 1:00 PM - 2:45 PM
Mentor(s): Christopher Saffron (Biosystems & Agricultural Engineering)

My summer research involves transforming poplar into biofuel and value added chemicals through fast pyrolysis. As a type of plant biomass, poplar is particularly important in the state of Michigan because it can quickly reach maturity due to high growth rates (growing 70-80 feet high and up to 10 inches in diameter in as little as six years). Poplar can also grow in fairly poor soils with minimal fertilizer and pesticide application. The challenge with poplar is it exhibits poor flow characteristics due to its low glass transition temperature. This leads to reactor plugging which, in turn, causes shorter run times and reduced product yields. The intent of this summer's research is to overcome these operational challenges and explore the pyrolysis of different biomass particle sizes, reactor temperatures, and reactor residence times. Once a successful pyrolysis trial has been accomplished, the resultant products will be characterized to inform the subsequent conversion steps needed to make biofuels.

THE EFFECTS OF ALKYLATIVE PRE-TREATMENTS ON DIGESTIBILITY OF HARDWOODS

Avery Blanks
Home Institution: University of Michigan
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 56
Time: 1:00 PM - 2:45 PM
Mentor(s): David Hodge (Chemical Engineering), Ryan Stoklosa (Agricultural Engineering)

In order to address the rising cost of fuel prices the world has turned toward alternative fuels for our cars, one such fuel is ethanol. Ethanol can be derived from any form of cellulose, also known as glucan, which is present in nearly all plant matter. For a plant such as wood steps must be taken before hand as the glucans are wound within a web of hemi-cellulose and lignin. Thus a pre-treatment of the wood may be used with various chemicals is used to separate the glucans before enzymes convert them to glucose monomers, which in turn are used to create ethanol. These pretreatments greatly increase the yield of ethanol after the reaction is completed. In this study we are looking to analyze the effectiveness of using alkali solutions, namely sodium hydroxide, on hardwood samples. The samples are prepared under various alkali conditions with variables such as temperature, particle size, enzyme loading, and time. Each condition is examined under HPLC (High Performance Liquid Chromatography) to observe the amount of glucose released. This data is compared among the variables and a control sample in order to characterize the overall effects of the alkylative treatment.

MONITORING IMPROVEMENT OF STORMWATER QUALITY USING DIFFERENT LOW IMPACT DEVELOPMENT PRACTICES

Riley Smith
Home Institution: University of Nebraska-Lincoln
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 57
Time: 1:00 PM - 2:45 PM
Mentor(s): James Coletta (Biosystems Engineering), Dawn Reinhold (Biosystems Engineering)

Stormwater from nonpoint sources such as roads, parking lots, and lawns can adversely affect the Red Cedar River due to chemicals and harmful nutrients gathered from urban surfaces. Michigan State University has implemented many low impact development system (LID) systems to prevent untreated stormwater runoff from reaching the river including rain gardens, riparian buffers, and green roofs. In order to determine if these LID practices are effectively improving the water quality of the stormwater, the inflows and outflows need to be monitored and analyzed. Three LIDs on campus that are being monitored are a wetland system, a bioretention basin, and a baffle box system. The improvement of the water quality at each system is being measured, using the parameters of chemical oxygen demand, pH, and total solids. Knowing the effectiveness

of each LID can lead to a better understanding of each systems strength and weaknesses in stormwater treatment.

ELECTROCATALYTIC HYDROGENATION OF LIGNIN MODEL COMPOUNDS USING RUTHENIUM LOADED ON ACTIVATED CARBON CLOTH

Evelis Rodriguez
Home Institution: University of Puerto Rico at Mayaguez
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 58
Time: 1:00 PM - 2:45 PM
Mentor(s): Mahlet Garedew (Biosystems & Agricultural Engineering), Christopher Saffron (Biosystems & Agricultural Engineering)

Using fast pyrolysis, biomass can be converted primarily to bio-oil, which has a great potential for production of biofuel and other value added products. Bio-oil needs to be upgraded due to certain properties (acidic, unstable, corrosive, etc.) that make it difficult to use commercially. Bio-oil is composed of depolymerized fragments of cellulose, hemi-cellulose and lignin. We are interested in upgrading lignin-derived products since it represents around 25-30% of biomass, has a great energy potential and it is a byproduct for many industries. Previous work by this group has shown that electrocatalytic hydrogenation (ECH) has been successful in reducing the lignin-derived monomers guaiacol, phenol and syringol. In this study we apply ECH to cleave and reduce lignin-derived model dimer into simpler compounds using a divided cell with Nafion membrane to separate the two compartments. Platinum wire is used in the anode and ruthenium loaded on activated carbon cloth (Ru/ACC) was used as the catalyst in the cathode side. The electrolytes were varied (HCl, NaOH, NaCl) to see which produces a greater yield and current efficiency. All the experiments are done using 4-phenoxyphenol a lignin-derived model compound. The result shows that 4-phenoxyphenol can be cleaved and reduced to phenol and cyclohexanol. Reusability test was also performed to study the performance of the catalyst when it is being reused for multiple experiments. The yields and current efficiency of the three experiments were recorded. The energy balance of the ECH process will be also done to study its current efficiency.

FUNGAL LIPID FERMENTATION FROM CORN STOVER USING A CO-HYDROLYSIS PROCESS

Christine Isaguirre
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 59
Time: 1:00 PM - 2:45 PM
Mentor(s): Wei Liao (Biosystems & Agricultural Engineering)

The annual crop residue, corn stover, was evaluated for its bioconversion potential to microbial lipid. The conversion was accomplished using a co-hydrolysis process which applied dilute acid pretreatment without detoxification or liquid-solid separation, directly followed by enzymatic saccharification and lipid fermentation. Due to its capability of utilizing C5 and C6 sugars and organic acids, the oleaginous mold Mortierella isabellina was selected and applied on the co-hydrolysate to accumulate fungal lipid. The cultivation using corn stover co-hydrolysate as the carbon source exhibited cell mass and lipid production and substrate utilization rates comparable to cultivation using a synthetic medium with pure glucose. These results revealed that combining co-hydrolysis and fungal fermentation to accumulate lipids may provide the potential for advanced lignocellulosic biofuel production.

FATE OF ANTIMICROBIAL CHEMICAL- TRICLOCARBAN (TCC) AND TRICLOSAN (TCS) IN AGRICULTURE FIELDS

Adriana Lopez-Maldonado
Home Institution: University of Puerto Rico at Mayaguez
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 60
Time: 1:00 PM - 2:45 PM
Mentor(s): Dawn Reinhold (Biosystems & Agricultural Engineering)

TCC and TCS are antimicrobial chemicals used in numerous soaps and personal care products. The presence of these chemicals in waste water treatment plants (WWTP) and subsequently in biosolids and irrigation water used in agriculture, has raised human health concerns. This research aims to study the fate of TCC and TCS in edible plants and soil, using both radio labeled and unlabeled TCC and TCS. The experiments will be carried in soil columns. Five vegetables - potato, onion, tomato, cabbage and chili - will be spiked with TCC in concentrations found in biosolids and effluent water of WWTP. TCC will be tracked in soils and plants using 14C-labeled TCC and unlabeled TCC using Liquid Scintillation Counter (LSC) and Liquid Chromatography- Mass Spectrophotometry (LC-MS). Prior to LSC and LC-MS analysis, the samples will be combusted in a sample oxidizer and the resulting C-14 from CO2, will be quantified. Concurrently, samples from the Accelerated Solvent Extractor (ASE) will be used to analyze the concentration of TCC and its degraded compounds in LC-MS. The same experiment will be carried with TCS.

ANTIMICROBIAL PROPERTIES OF A NOVEL SAUSAGE CASING
Andrea Jackson
Home Institution: Florida A&M University
Category: Biosystems and Agricultural Engineering, Section 2
Poster: 61
Time: 1:00 PM - 2:45 PM
Mentor(s): Eva Almenar (Packaging)

Antioxidant, antimicrobial and good film-forming capability are some properties attributed to chitosan. Preparation of a novel sausage casing using chitosan would potentially improve sausage quality and safety. Does the addition of cinnamon essential oil (CEO) in chitosan casing enhance its antimicrobial ability? This research seeks to improve the antimicrobial properties of chitosan-based casings to perform better than collagen casings that are commercially available under sausage manufacturing conditions. In order to evaluate the antimicrobial properties of the casing, ground beef will be stuffed in the collagen (control) and the chitosan (with and without CEO) casings and the resulting sausages will be stored aerobically to give a worst-case scenario for casing testing at 4 °C. The sausages will be removed from their casings at day 0, 5, 10, 15, and 20. Then, an amount of sausage will be homogenized, appropriately diluted and plated. It will be quantitatively examined for L. monocytogenes, total aerobic plate count, and lactic acid bacteria (LAB). All the results will be reported as log 10 colony forming units per grams (cfu/g). Additionally, the amount of CEO present in the casing after processing will be evaluated to determine if there is a correlation between the quantity of CEO in the casing and the microbial load of the sausage. This will be evaluated using a solid phase micro extraction (SPME) fiber and gas chromatography.

EXTRACTION AND DETECTION OF E. COLI O157:H7 FROM FOOD MATRICES USING MAGNETIC NANOPARTICLES
Kasey Pryg
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 3
Poster: 62
Time: 3:15 PM - 5:00 PM
Mentor(s): Evangelyn Alocilja (Biosystems & Agricultural Engineering)

When the food safety industry tests foods for *E. coli*, long incubation periods, restrictive equipment, and expensive testing hinder them. However, using magnetic nanoparticles attached to an antibody, *E. c*oli O157:H7 can be magnetically separated from leafy greens, milk, and apple juice in a timely, efficient, and cost-effective manner. My research focused on using magnetic polyaniline attached to an anti-*E. coli* O157:H7 antibody to extract *E. coli* O157:H7 from a spinach matrix. Further, after extraction was performed, detection was accomplished using a gold nanoparticle tracer and a potentiostat, allowing for rapid detection to be coupled to a rapid and effective separation. The procedure of magnetic separation and detection will shorten the time and decrease the cost of testing food samples for *E. coli* O157:H7 contamination, thereby allowing more samples to be tested in a shorter amount of time. This procedure is also user friendly, and requires little to no formal training for effective use. Further, it is mobile, only requiring viable field equipment. Increased productivity combined with decreased cost will, hopefully, reduce the number of *E. coli* outbreaks.

DATA-DRIVEN SOLUTIONS TO ENVIRONMENTAL MONITORING
Matt Gammans
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 3
Poster: 63
Time: 3:15 PM - 5:00 PM
Mentor(s): Jade Mitchell-Blackwood (Biosystems & Agricultural Engineering)

The Clean Water Act mandates that the Environmental Protection Agency (EPA) collect data from manufacturing facilities that are potential water pollution sources. Currently, inspectors often rely on whistleblowers or self-reported violations, with minimal use of the collected data. This project proposes to use data collected between 1993 and 2001 from manufacturing facilities in the paper, pulp, oil, and steel industries to develop a decision support model to improve the EPA's environmental monitoring program. To accomplish this, SPSS statistical software has been used to find correlating trends between economic data, such as revenues, assets, and shareholder value, and environmental data, such as the quantity, concentration, and frequency of biological, chemical, and physical pollutant emissions. Additionally, patterns within self-reported data are analyzed to determine if these may indicate dishonest reporting.

A SYSTEMS ANALYSIS COMPARING ELECTROCATALYTIC AND CATALYTIC BIOENERGY SYSTEMS FOR PRODUCING GREEN DIESEL FROM HYBRID POPLAR

Nichole Erickson
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 3
Poster: 64
Time: 3:15 PM - 5:00 PM
Mentor(s): Christopher Saffron (Biosystem Engineering)

This poster includes a comparative life cycle analysis of two green diesel production systems, electrocatalytic hydrogenation and catalytic hydrogenation. Both systems use the same supply chain, starting with hybrid poplar plantations, and depolymerize biomass using fast pyrolysis (rapid heating in the absence of oxygen). Catalytic hydrogenation of pyrolysis gas derived from fast pyrolysis has been achieved yet remains infeasible due to coke formation, which results in catalyst deactivation. Safe deployment in small-scale facilities and relatively high costs as compared to petroleum routes also pose barriers to implementation. The aim of this study is explore the use of decentralized electrocatalysis as a substitute for direct hydroprocessing at petroleum refineries. By comparing both models in a functionally equivalent manner, the more sustainable approach can be determined in terms of environmental impacts and economics. An annual production rate equal to 100 million gallons of dodecane (C12H26), a potential surrogate for diesel fuel and other petroleum products, was selected as the functional unit for both bioenergy systems. A physical allocation of environmental burdens using mass flow ratios was chosen to compare these complex energy systems. Preliminary data suggests that electrocatalysis will significantly lower the feedstock requirements, environmental impacts, external hydrogen needs, and economic costs when compared to the strictly catalytic approach.

OPTIMIZING HEAT TRANSFER FOR A BENCH SCALE SOLAR COLLECTOR

Robert Kraemer
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 3
Poster: 65
Time: 3:15 PM - 5:00 PM
Mentor(s): Mauricio Bustamante (Biosystems Engineering), Wei Liao (Biosystems Engineering)

A bench scale solar collector was constructed for data collection. The purpose of the unit is to generate technical information that can be used as design parameters for the pilot plant at the ADREC facility. The unit consists of two mechanical actuators that continuously adjust a Fresnel lens according to the position of the sun. The relationship between focal length and temperature at the focal point was investigated to generate the temperature profile. A metallic plate is used to receive incoming solar radiation until the system reaches steady state. Manipulating focal length affects focal area, therefore affecting energy density. Energy density is an indicator of thermal efficiency for solar heat concentration. Energy density will be optimized for heat transfer. Solar radiation was also recorded, in order to measure the maximum temperature at a specific radiation level. Three different focal lengths were tested at three different times of day.

MONITORING LIVESTOCK AIR EMISSIONS AND UPDATING AAQRF SYSTEM

Andrew Stoffel
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 3
Poster: 66
Time: 3:15 PM - 5:00 PM
Mentor(s): Wendy Powers (Animal Science & Biosystems Engineering)

Air emissions produced by livestock is a growing concern, particularly related to greenhouse gases and global warming, thus becoming more important to the consumer. At the Animal Air Quality Research Facility (AAQRF) at Michigan State University, research examines the air emissions produced from livestock farms based on different diets fed to the animal and the post excretion practices. Currently the emissions measured include methane, hydrogen sulfide, ammonia, and specific volatile carbons produced and also the nutrient flow of the entire farm system. By examining the diets and post excretion strategies to develop the most effective reduction approaches, greenhouse gases produced by livestock can be reduced to eliminate agriculture's contribution to global warming. Currently the system is outdated and in need of an update. I am rewriting the Lab VIEW code to accommodate the new gas analyzers and software being purchased for the newly constructed addition. As of now no research is currently being studied. Once the updated code and hardware is acquired the studies will resume.

THE EFFECTS OF THE INHIBITOR IODOFORM ON ANAEROBIC DIGESTION FOR ACETIC ACID ACCUMULATION

Alex Whitlow
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 4
Poster: 67
Time: 3:15 PM - 5:00 PM
Mentor(s): Wei Liao (Biosystems & Agricultural Engineering), Yuan Zhong (Biosystems & Agricultural Engineering)

Annual production of animal manure in the United States is close to 12 million dry tons. This much manure without treatment could result in a substantial amount of greenhouse gas production and environmental contamination. Treatment of all this waste would be expensive, but with processes like anaerobic digestion (AD) the waste could be made into biogas and other valuable assets. One such asset is acetic acid, which can be used as intermediate for other value-added chemical and fuel production. It has been repoted that biogas and acetic acid production an inverse relationship. Previous research has been done on the effects of using iodoform as a biogas inhibitor in sewage sludge anaerobic digestion. Results of the experiment showed that iodoform was effective in acetic acid accumulation. A comprehensive study was carried on in this study to further explore the effects of iodoform on anaerobic digestion of dairy manure for acetic acid accumulation. Two culture temperatures (35C and 50C) and three iodoform concentrations were tested using a completely randomized experimental design (CRD). The acetic acid concentration will be the criterion to evaluate the anaerobic digestion performance under different iodofrom and temperature conditions.

EFFECTIVELY MONITORING ANIMAL AIR QUALITY AND LIVESTOCK EMISSIONS

Anh Bui
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 4
Poster: 68
Time: 3:15 PM - 5:00 PM
Mentor(s): Wendy Powers-Schilling (Biosystems Engineering)

Climate change has become persistent in today's society and ecosystems. Climate change is largely the result of greenhouse gases. Greenhouse gases are emitted from many sources including many manmade facilities and various natural occurrences. Cattle emissions are one of many contributors to greenhouse gases. Because animal agriculture is important for today's economic growth, it is relevant to monitor the potential greenhouse gas contribution from cattle and prevent overproduction of greenhouse gases. Laboratory protocol was constructed to enable measurement of greenhouse gases from livestock housing of twelve chambers that house cattle or other livestock species. In order to effectively control the system and obtain quantitative data from the monitoring system, the software Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is used. It is beneficial to use LabVIEW because it provides the user an organized visual representation of the controls in the system, requires minimal coding knowledge, is compatible with many types of instruments and data acquisition software, and its users can easily spot troubleshooting in the program. LabVIEW collects data about system conditions and emission data for future analysis. Though LabVIEW is an effective tool for operating this system, the program still requires extensive learning. Many existing programs can be optimized in order to accommodate new software and improve understanding of the system. Having a strong working knowledge of LabVIEW will also enable its user to create programs that will control advanced instrumentation such as the INNOVA analyzer.

OPTIMIZATION OF ELECTROCOAGULATION TO RECLAIM ANAEROBIC DIGESTION EFFLUENT

David Stromberg
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 4
Poster: 69
Time: 3:15 PM - 5:00 PM
Mentor(s): Wei Liao (Biosystems Engineering), Yan Liu (Biosystems Engineering), Zhiguo Liu (Biosystems Engineering)

Electrocoagulation (EC) is a chemical-free, electrochemical treatment widely used in various waste management plants for water reclamation. Generally, the fundamental principle of the process is to alter charges on particles by passing electrical current through water, so that larger and heavier colloidal clumps are formed to precipitate contaminants down. In this study, we will use EC to clean up agricultural waste water, the anaerobic digestion effluent. Anaerobic digestion (AD), is widely utilized technology for animal and food waste management. A large amount of potentially hazardous effluent generated from AD is relatively difficult to handle because of its high level of nitrogen, phosphorous and organic matter. Three parameters, current strength, retention time, and surface area of electrodes, with three levels for each parameter, are used to optimize the EC treatment process using a complete randomized design (CRD). Based on this optimization, we will be able to develop a sustainable strategy to reclaim water from the AD effluent, with which a further utilization such as algae culture may be carried out to make our process more energy efficient and environmentally friendly.

RECOVERY AND PERSISTENCE OF VARIOUS BACILLUS SPORES FROM HVAC FILTERS
Erik Blackowicz
Home Institution: Michigan State University
Category: Biosystems and Agricultural Engineering, Section 4
Poster: 70
Time: 3:15 PM - 5:00 PM
Mentor(s): Jade Mitchell (Biosystems & Agricultural Engineering)

The Center for Disease Control and Prevention categorizes *Bacillus anthracis* as a Category A microorganism, which is considered to pose the greatest threat to public health and was the same bacterium responsible for the 2001 anthrax attacks. Continuing research on microbial recovery from porous surfaces, such as HVAC filters, can provide helpful information essential for public risk response in the event of another bioterrorist attack or outbreak of pathogenic microbes. A better understanding of microbial adhesion properties would strengthen public safety in response to recent biological fears. This study aimed to compare the recovery and persistence of *Bacillus anthracis*, *Bacillus thuringiensis*, *Bacillus subtilis* and *Bacillus cereus* spores from HVAC filters using an aqueous elution method, in effort to identify distinctions among in vitro *Bacillus species*. Quantification of spore recovery was done at 0, 24, and 48 hours prior to the initial dosing of bacteria to analyze potential spore growth during the extraction process. For the elution process, a sonicate vortex-shake method was used as described in Solon and Gurian. Preliminary plate count results for *B. cereus* and *B. anthracis* indicate a decrease in spore recovery from 0 to 48 hours, continued results are pending. Results for *B. subtilis* and *B. thuringensis* are yet to be determined. Quantification methods chosen for spore recovery included spread plate counts, hemocytometer, biosensor antibody, and Q-PCR.

CLOSING THE ENERGY BALANCE IN A BIOMASS FAST PYROLYSIS REACTOR
Gregory S. Repka
Home Institution: The Ohio State University
Category: Biosystems and Agricultural Engineering, Section 4
Poster: 71
Time: 3:15 PM - 5:00 PM
Mentor(s): Chris Saffron (Biosystems Engineering)

Energy demand is growing worldwide with growing population rates and advancements in societies. Currently these energy demands are mostly provided by fossil fuels; oil, gas and coal, however these sources will not last forever. Accordingly, a new sustainable source of energy is needed to replace the depleting fossil deposits, and fast pyrolysis of biomass is showing promise in this field. The goal of this research is to develop an efficient fast pyrolysis system that will produce bio-oil yields greater than 60% on a dry biomass basis. This summer, an existing pyrolysis system was modified to run poplar biomass, by overcoming reactor plugging due to the low glass transition temperature of poplar lignin. One objective of this summer's research is to collect the necessary data to completely close the energy balance that encompasses the reactor. To that end, electrical current meters have been installed to determine the electrical energy needed to heat the reactor barrel and drive the screw conveyor shaft. The result of this work will be a determination of the "energy return on energy invested," or EROI, which will be useful for evaluating fast pyrolysis as a biomass conversion approach.

CELL BIOLOGY, GENETICS, & GENOMICS

DIFFERENCES IN METHYLATION OF LAG3 AND GATA3 IN GERM FREE AND CONVENTIONALLY REARED MICE
Zuania Cordero Badillo
Home Institution: University of Puerto Rico at Rio Piedras
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 75
Time: 1:00 PM - 2:45 PM
Mentor(s): Susan Ewart (Large Animal Clinical Sciences)

Asthma is a chronic inflammatory disease of the airways that has both environmental and genetic causes. The hygiene hypothesis links asthma to lack of exposure to microorganisms, like bacteria, early in childhood shifting the T helper (Th) 1/Th2 balance towards the Th2 response, which has been associated with immunological disorders. Our lab has shown a relationship between the microbiota of an organism and its epigenome through changes in methylation in Gata3 and Il13ra1, genes that relate to expression of asthma. To further understand this relationship two genes previously associated with allergic diseases, GATA3 and LAG3 will be studied in a mouse model. GATA-3 is associated with Th2 responses while LAG-3 is present in Th1 cells. We hypothesized that the difference in microbiota in germ-free (GF) and conventionally-reared (CR) mice will produce differential methylation in Lag3 and Gata3 genes. DNA methylation in Lag3 and Gata3 was compared between GF and CR mice. DNA from spleens was bisulfite converted, amplified by PCR and pyrosequenced. We identified CpG islands and assessed methylation percentages in these genes. We predict that GF mice will mount a Th2 immunological response and vice versa. We expect Gata3 to be unmethylated in GF mice and methylated in the CR. However, LAG-3 is

associated with the Th1 effector cells therefore we expect Lag3 will be more methylated in GF mice than in CR mice.
FUNDING: NIH grant HL103156

DOES CHEMERIN-9 CAUSE ENDOTHELIUM DEPENDENT VASCULAR RELAXATION?

Karen Toledo
Home Institution: University of Puerto Rico at Arecibo
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 76
Time: 1:00 PM - 2:45 PM
Mentor(s): Stephanie Watts (Pharmacology & Toxicology)

Chemerin is a new adipokine associated with obesity and the metabolic syndrome. The peptide chemerin is a candidate for connecting fat deposits around the blood vessel (perivascular adipose tissue) PVAT to arterial contraction. In physiological situations, PVAT releases numerous adipokines, like Chemerin, which play an important role in the maintenance of vascular resistance. Chemerin activates ChemR23 to lead to arterial contraction when the endothelium is dysfunctional. The primary chemerin receptor ChemR23 was expressed both in tunica media and endothelial layer suggesting Chemerin may have a function in both endothelial and smooth muscle cells. Our hypothesis is that Chemerin in low concentrations activates an endothelial ChemR23 to cause relaxation. In higher concentrations Chemerin also activates a smooth muscle ChemR23 to cause contraction. Isometric contraction will be measured in the isolated tissue bath to investigate the physiology and pharmacology of endothelium intact from male rat aorta. We anticipate Chemerin-9, as a stable analog of Chemerin, will cause the relaxation of the tissue. We also anticipate this will be reduced by nitric oxide synthase inhibition. Our goal through this research is to identify ChemR23 receptors in endothelial cells, causing tissue relaxation and improve therapies and new mechanisms to reduce the risk of cardiovascular disease.

READ MAPPING BIAS IN ALLELE SPECIFIC EXPRESSION

Lavida Brooks
Home Institution: University of the Virgin Islands
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 77
Time: 1:00 PM - 2:45 PM
Mentor(s): Titus Brown (Computer Science Engineering, Microbiology & Molecular Genetics), Likit Preeyanon (Microbiology)

There are several studies being done that are trying to measure allele-specific expressions through short read mapping. Read mapping is a process where the location of a read or reads is determined by assigning reads to a reference genome. However sequencing errors and polymorphisms causes a mapping bias toward the reference alleles. Therefore, a reference allele will have more read counts than a variant, which leads to inaccurate estimate of allele specific expression. This mapping bias is due to having to allow mismatches when reads are mapped to the genome. If mismatches are not allowed, however, some reads will still map to the genome, but reads with sequencing errors and polymorphisms will not and this in turn would lead to a loss of valuable data. Scientists are trying to find ways to improve the accuracy of allele specific expression through several methods. This study determines if an in-house error correction method, which reduces sequencing errors, could be used to improve the accuracy of the allele specific expression. The organism used in this study is the Drosophilia melanogaster (the fruit fly) because of its genome being small in size and easy to work with. We will be using bioinformatics tools to complete these tasks. For example, the bowtie program will be used to map reads to a reference genome and the flux stimulator will be used to produce reads/stimulations of reads. Several custom Python scripts will be used to process sequencing data as well as to analyze the results.

MLK SIGNALING IN GLIOMA INVASION

Sean Misek
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 78
Time: 1:00 PM - 2:45 PM
Mentor(s): Kathleen Gallo (Physiology)

Each year approximately 13,000 Americans die from brain tumors. Gliomas, brain tumors which arise from glial cells, are highly invasive and often inoperable, leading to survival times of about a year. Elucidating protein kinase signaling pathways that drive invasion is critical for identifying therapeutic targets and developing effective therapies. Mixed Lineage Kinase 3 (MLK3) activates multiple mitogen activated protein kinase (MAPK) pathways and also regulates GTPase activity.Our lab has shown that MLK3 is critical for breast cancer cell migration, invasion, and metastasis. In this study,the role of MLK3 in signaling, migration, cytoskeletal changes, and invasion of human glioma cells was investigated using gene silencing, as well as a small molecule inhibitor. In addition, a model of glioma invasion has been developed in which spheroids of glioma cells are transplanted into a matrix that mimics the human ECM and allowed to disseminate.

cAMP AND ITS ROLE IN MÜLLER CELL RESPONSE TO HYPERGLYCEMIC CONDITIONS

Robert Frisk
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 79
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), Susanne Mohr (Physiology)

Background: Müller cells, the principal glia of the retina, are a major source of active caspase-1 and the pro-inflammatory cytokine interleukin-1β (IL-1β) under hyperglycemic conditions. The anti-inflammatory interleukin-10 (IL-10) is a potent negative regulator of the caspase-1/IL-1 pathway. Cyclic adenosine monophosphate (cAMP) is a well-known cellular second messenger. Whether cAMP plays a role in the regulation between the pro- and anti-inflammatory pathways has yet to be elucidated. Therefore, the focus of this project was to identify how cAMP influences hyperglycemia-induced caspase-1/IL-1β activation and IL-10 production in Müller cells. **Methods/Results:** The retinal Müller cell line (rMC-1) was treated with normal glucose (5mM) and high glucose (25mM) for up to 72 hours. cAMP and IL-10 levels were determined by ELISA assay. Hyperglycemia increased cAMP levels by 1.71 fold compared to control at 48 hours in Müller cells. However, at 24 and 72 hours, levels of cAMP are similar in normal glucose-treated versus high glucose-treated cells. Hyperglycemia did not affect cAMP levels in these cells at short-time exposure (0, 2, 6, 8, 24 hours) to high glucose. At 48 hours of high glucose treatment, IL-10 levels were increased compared to control. **Conclusions:** Our data indicate a potential relationship between increased cAMP levels and IL-10 production in Müller cells under hyperglycemic conditions. Changes in cAMP levels may help explain the lack of anti-inflammatory responses to the pro-inflammatory hyperglycemic stimulus in Müller cells. **Support:** R.F. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

ELUCIDATE THE ROLE OF IL-2 AND IL-21IN TCDD-MEDIATED SUPPRESSION OF B CELL ACTIVATION

Barbara Avalos-Cavero
Home Institution: University of Puerto Rico at Rio Piedras
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 80
Time: 1:00 PM - 2:45 PM
Mentor(s): Norbert Kaminski (Center for Integrative Toxicology)

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is the most toxic compound among the group of halogenated aromatic hydrocarbons found in our environment. TCDD is known to adversely affect the adaptive immune system, specifically the humoral immune response. Several studies using rodents have shown that TCDD affects the differentiation of B cells into plasma cells, or antibody-secreting cells. Recent work using human primary B cells in the laboratory has shown that B cell activation is suppressed significantly by TCDD, thereby, subsequently affecting the process of B cell differentiation. Specifically, B cells activated with CD40 ligand and cytokines (IL-2, IL-6, IL-10) show suppression of B cell activation markers CD80, CD86, and CD69. IL-21 is a cytokine known to enhance the proliferation of B cells, playing a vital role in their differentiation. The goal of this study is to understand the effects of IL-21 in suppression of human B cell activation. Using CD40 ligand and cytokines IL-2 and IL-21, primary human B cells will be activated and in another group the cytokines IL-2 and IL-21 alone will be used, in combination with TCDD treatment. Measurements of the effects of TCDD on B cell activation markers (CD80, CD86, and CD69) will be performed using the flow cytometry and the changes in levels of BCL-6 and SHP-1, genes known to be altered in B cell activation, will also be investigated. The results obtained from this project will further our understanding of TCDD-mediated suppression of B cell activation.

EFFECT OF NOVEL TELOMERASE INHIBITOR ON TRIPLE-NEGATIVE BREAST CANCER CELLS

Alexander J. Fisch
Home Institution: Grand Valley State University
Category: Cell Biology, Genetics and Genomics, Section 1
Poster: 81
Time: 1:00 PM - 2:45 PM
Mentor(s): Osman V. Patel (Grand Valley State University: Cell and Molecular Biology), William Schroeder (Grand Valley State University: Chemistry), Robert Smart (Grand Valley State University: Chemistry), Rebecca Uzarski (Central Michigan University: Biology)

To date, there is no standard therapy for breast cancer classified as triple negative in which there is limited expression of the three key receptors (estrogen, progesterone, epithelial growth factor) known to trigger breast cancer. This particular aggressive form of breast cancer has higher rates for visceral metastases and recurrence, together with guarded prognosis. Recently, studies have targeted an enzyme named telomerase that is recognized to play a pivotal role in development and immortalization of cancer cells. Therefore, our objectives were, (i) to assess the short-term effects of a novel anti-telomerase molecule (GV6) developed at our institute on MDA-MB 231 (triple negative) breast cancer cells, and (ii) to compare and contrast the effects of GV6 to that of two well-known inhibitors of telomerase, 3'-azido-3'-deoxythymidine (AZT) and BIBR1532. Culture flasks (T-75) were seeded with approximately 1x10⁶ cells/ml and supplemented with either

GV6 (n=4) or BIBR1532 (n=4) or AZT (n=5) or solvent alone (Control, n=3) for 5 or 14 days. Assessment of cell viability was done using the Trypan Blue (Gibco) exclusion test. In comparison to Control, the number of viable cells decreased by about 20% (P<0.05), 40% (P<0.05) and 30% (P<0.05) after 5 days of GV6, BIBR1532 and AZT exposure, respectively. By day 14 of GV6, BIBR1532 and AZT supplementation, the counts dropped to about 35% (P<0.05), 42% (P<0.05) and 45% (P<0.05) of Control, respectively. Our results indicate that GV6 is an equally potent inhibitor of telomerase and merits further investigation.

EFFECTS OF THE OVEREXPRESSION OF PRO-APOPTOTIC GENES MMBID, MMBAX AND ATCYTOCHROME C IN ARABIDOPSIS THALIANA

Nicole Colon Carrion
Home Institution: University of Puerto Rico at Cayey
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 82
Time: 1:00 PM - 2:45 PM
Mentor(s): Ronghui Pan (Plant Biology)

Program Cell Death (PCD) plays a vital role in the annihilation of undesirable cells in eukaryotic species. Plant PCD is essential for plant development and stress response. In contrast to well-characterized animal apoptosis machinery, plant PCD is very poorly understood at the molecular level. However, several morphological and function similarities between apoptosis and plant PCD have been described, such as DNA fragmentation and cytochrome c release. Two factors, Bid and BAX, have been shown as essential for cytochrome c release in apoptosis. Cardiolipin (CL), a unique mitochondrial membrane structural lipid, plays pivotal roles in apoptotic cytochrome c release, too. Previous studies in our lab revealed the conserved importance of CL in plant PCD. We revealed a novel vesicle like structure, by which CL departs from mitochondria in PCD. We speculate that these vesicle structures may be critical for the initiation of PCD. A model is proposed, in which cytochrome c, BID and BAX cooperate to promote the redistribution of CL via vesicles in PCD. Here we plan to analyze the localization of CL vesicles and these three proteins during PCD through fluorescence microscopy. Gateway cloning technique is employed to clone these genes with YFP fusion. Mice pro-apoptotic factors Bid and Bax and Arabidopsis Cytochrome c will be overexpressed in Arabidopsis thaliana to elucidate the Plant PCD. Understanding the mechanism of PCD in plants will not only elucidate its plant specific functions, but may also provide extensive implications in human biology.

P2 RECEPTOR IS INVOLVED IN ATP INDUCED MESENTERIC ARTERIAL CONSTRICTION IN NORMOTENSIVE AND DOCA-SALT HYPERTENSIVE RATS

Mary Lian
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 83
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), James Galligan (Pharmacology & Toxicology), Hui Xu (Pharmacology & Toxicology)

Introduction: Diameter of mesenteric arteries (MA) which is an important determinant of blood pressure (BP) is mainly controlled by sympathetic nerves (SN). SN co-release norepinephrine (NE) and ATP to constrict arterial smooth muscle cells (SMCs), increasing BP. Pannexin channel-1 is an ATP permeable hemichannel that mediates ATP released from SMCs in response to alpha1-adrenergic receptors (AR) by NE. ATP (P2YR agonist) is released and acts back on SMCs for further constriction. **Objective:** We investigated pannexin-1 role on MA constriction by testing ATP, phenylephrine (PE, α1-AR agonist) and KCl in pressurized MA from normotensive and DOCA-salt hypertensive rats with or without PPADs (P2R antagonist) in vitro. **Methods:** Blood vessel constriction by ATP, PE and KCl were recorded with pressurized myograph coupled with video microscopy before and after adding PPADs. **Results:** PE and KCl concentration response curves were similar with or without PPADs in MA from normotensive and hypertensive rats. However, PPADs significantly shifted ATP concentration response curves to the right in MA of both rats. **Conclusions:** PPADs did not significantly inhibit PE-induced constriction, but ATP-induced constriction was significantly inhibited. We conclude that α1-AR mediated constrictions of rat MA are not caused by ATP released from SMCs to act on PPADs sensitive P2R. Future studies will use antagonists of other SMCs ATR receptors in an effort to inhibit PE-induced constriction. **Support:** M.L. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

EFFECTS ON CHROMATIN STRUCTURE AT TRANSCRIPTIONAL REGULATORY ELEMENTS OF MOUSE MACROPHAGES UPON C/EBP INHIBITION

Lucas Fix
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 84
Time: 1:00 PM - 2:45 PM
Mentor(s): Monique Floer (Biochemistry & Molecular Biology)

Chromatin architecture is thought to have a major effect on gene regulation. Cell-type specific transcription factors like (C/EBP), which is required for macrophage development and function, could affect nucleosome positioning, phasing, and occupancy at transcriptional regulatory sites. These kind of modifications could are involved in cell identity and cell type-specific responses. It is thought that nucleosome positioning and removal at enhancer and promoter regions is crucial for proper transcriptional regulation. However, the mechanisms behind transcription factors and transcriptional machinery gaining access to their sites in chromatin is not well understood. Here we analyze DNA-binding of C/EBP family transcription factors and its effects on nucleosome binding before and after inhibiting C/EBP with a betulinic acid treatment at 6 hour and 24 hour exposures. We use betulinic acid as an inhibitor because it was recently shown to markedly inhibit DNA-binding of the C/EBP family of TFs both in vitro and in vivo (Hollis et al, 2012). In addition, it also has antiretroviral, antimalarial, and anti-inflammatory properties, and recent studies point towards it being an anticancer agent. We have analyzed the effect of betulinic acid on nucleosome occupancy at regulatory regions of three pro-inflammatory genes (IL12B, IL1A and IFNB1) known to bind C/EBP. All three genes are inducible, pro-inflammatory cytokines which are expressed specifically in macrophages, only in response to bacterial or viral challenge. Understanding how inhibition of C/EBP affects nucleosome occupancy will provide valuable insight in the role of this lineage-specific transcription factor in determining chromatin architecture at regulatory elements.

CHARACTERIZATION OF GUT LYMPHOCYTES IN WILD-TYPE AND NRF2-NULL MICE

Brian Harvey
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 85
Time: 1:00 PM - 2:45 PM
Mentor(s): Cheryl Rockwell (Pharmocology & Toxicology)

Background: Within the gut associated lymphoid tissues, both Peyer's patches (PP) and intraepithelial lymphocytes (IEL) contribute to immune system maintenance and response. PP are lymphoid organs mostly comprised of B and T cells and are important in immune responses. IEL are mostly comprised of CD8 $\gamma\delta$ T cells, which are a rare and specialized T cell subtype important in providing rapid defense against gut pathogens. Nrf2 is a transcription factor, activated by cell stress including oxidative stress and electrophilic insult. Upon activation, Nrf2 upregulates genes that promote cell survival. Further, Nrf2 has an important role in immune cell regulation, including macrophage function and T cell differentiation. However, the role of Nrf2 in gut lymphocyte regulation has not yet been characterized. Thus, this study aimed at developing protocols to extract PP and IEL from wild-type and Nrf2-null mice, to characterize gut lymphocyte populations. **Methods/Results:** Purified cell populations from PP and IEL were successfully prepared using a Percoll density gradient. The methods were optimized to improve cellular viability and yield, consistently resulting in viability above 80%. Using flow cytometry, $CD3^+$, $CD4^+$ helper, and $CD8^+$ cytotoxic T cells were quantified within PP from wild-type and Nrf2-null mice. Further, CD8 $\gamma\delta$ T cells in the IEL fraction were identified. Studies are ongoing to evaluate function of isolated intestinal lymphocytes derived from wild-type and Nrf2-null mice. **Support:** B.H. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

THE ACTIVITY OF NFKB1 IN PALMITATE TREATED HEPG2 CELLS

Hollie Adejumo
Home Institution: University of Maryland Baltimore County
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 86
Time: 1:00 PM - 2:45 PM
Mentor(s): Betul Bilgin (Chemical Engineering & Materials Science), Christina Chan (Chemical Engineering & Materials Science), Aritro Nath (Chemical Engineering & Materials Science), Patrick Walton (Chemical Engineering & Materials Science)

Palmitate (PA) is a saturated free fatty acid (FFA) commonly ingested and synthesized by the body's fatty acid metabolism pathway. While PA presents many oxidative benefits, such as providing fuel for the heart and skeletal muscles (Kovacs & Stumvoli, 2005), excess PA levels are associated with several inflammatory liver conditions, including Nonalcoholic Fatty Liver Disease (NAFLD), Type II Diabetes, Nonalcoholic Steatohepatitis (NASH) and cirrhosis (National Institutes of Health, 2006). Previous studies have indicated that persistent activation of the transcription factor Nuclear Factor Kappa B (NFKB1) gene is related to inflammation, and modulates apoptosis and cell growth (McKusick et al., 2013). Additionally, studies show that inhibiting the NFKB1 pathway could be used to treat inflammation and cancer (Yamamoto & Gaynor, 2001). In order to further understand the effects of elevated PA levels on the liver, this study aims to identify the effects of palmitate on NFKB1 activity in HepG2 cells, a human hepatocellular carcinoma cell line (Javitt, 1990). We hypothesize that PA enhances NFKB1 expression and activity in HepG2 cells. To test this hypothesis, HepG2 cells will be cultured in various concentrations of PA or BSA (control) media for different time periods. Using a haemocytometer, the number of living and dead cells will be counted. The findings of this research can potentially determine if there is a link between PA, NFKB1 activity, and liver diseases. If NFKB1 is associated with liver diseases, this study may result in the innovations of liver disease therapy research.

MICRORNA858A AND THE UNFOLDED PROTEIN RESPONSE

Seth Menzer
Home Institution: Wheaton College
Category: Cell Biology, Genetics and Genomics, Section 2
Poster: 87
Time: 1:00 PM - 2:45 PM
Mentor(s): Cristina Ruberti (Plant Biology)

The unfolded protein response (UPR) is a conserved mechanism by which organisms mitigate stress caused by the accumulation of misfolded proteins in the endoplasmic reticulum (ER). In plants, the UPR is induced by the activation of RNA-splicing factor IRE1 (inositol-requiring enzyme 1) and of ER-membrane associate transcriptional factors. Once activated, these ER stress-sensor proteins induce the transcription of UPR target genes, which assist in protein folding, participate in the degradation of misfolded protein, and help regulate programmed cell death. microRNAs are small noncoding RNAs which play significant roles in translational repression and have recently been identified as key regulators in the UPR signaling pathway. Our RNA-seq data indicate a difference in the expression of some microRNAs in Arabidopsis atire1 mutants compared with wild type plants, suggesting an involvement of these microRNAs in the IRE1-mediated UPR pathway. Here we investigate the role of microRNA858a in the UPR. In order to study the function of microRNA858a, its expression was silenced by a RNAi approach: three different hairpin RNAi constructs were designed and obtained to target both its primary mRNA transcript and its promoter. microRNA858a was also overexpressed by cloning an insert spanning its promoter and coding region downstream of the 35S constitutive promoter. Arabidopsis plants will be stable transformed with these constructs and their ER-stress tolerance will be tested. RNA-seq and qPCR techniques will then be used to investigate whether microRNA858a regulates the expression of other genes in the UPR pathway.

CELL RECOMBINATION TRANGENICS IN SACCHAROMYCES CEREVISIAE

Stephen Kinunda
Home Institution: East Tennessee State Unversity
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 88
Time: 3:15 PM - 5:00 PM
Mentor(s): Barry Williams (Evolutionary Genetics)

Transgenesis is a process that involves adding foreign genes to an animal's DNA. The technology began in the 1980s with the implication to plants. The majority of transgenes are used for research purposes. Transgenic biotechnology allows us to test a given gene either by turning it on for a long period of time or controlling its gene expression. After knowing the function of a gene, cross pollination can be done to identify the presence with the assistance of (MAS) marker assisted selection. The selection of choosing interested genes to be passed on to the next generation. Yeast genetics can be used in many various areas of studies including, agriculture, and industrial technology. Yeast plays a major role in making quality wines, use of probiotics, and biofuel production. If we are able to determine that genetic deleterious mutation can be solved by cell recombination, highly resistant medicine and organ transplants can be easily made and delivered to patients.

RETINAL TRANSDUCTION EFFICACY OF FOUR AAV VECTORS IN 30-DAY-OLD KITTENS

Kenisha Y. Rivera Adames
Home Institution: University of Puerto Rico at Mayagez
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 89
Time: 3:15 PM - 5:00 PM
Mentor(s): Simon Petersen-Jones (Small Animal Clinical Sciences)

Leber Congenital Amaurosis (LCA) is a severe inherited early-onset retinal degeneration in humans. Two gene mutations in cats were discovered to cause similar LCA-like retinal dystrophies, making them useful models to study treatments for LCA. These mutations in cats occur in 2 of the 17 genes known to cause LCA. One mutation occurs in CEP290 causing a recessive retinal degeneration and the other occur in CRX causing a dominant inherited retinal degeneration. Subretinal injection of adeno-associated viral vectors (AAV) is a promising technique for gene therapy in the retina. The efficacy of transduction of photoreceptor cells in cats needs to be further characterized before initiating the development of treatments for LCA. The objective of this study was to determine which serotype of AAV vectors is more efficient for transduction of photoreceptor cells. Two phenotypically normal kittens were subretinally injected with AAV2/8, AAV2/5, AAV2/2 Triple and AAV2/2 Quad serotypes, packaged with the gene for green fluorescent protein (GFP). Kittens were monitored over time for in vivo GFP fluorescence using eye examinations and wide-field fundus images. Immediately after euthanized the kittens, eyes and brain segments were collected and fixed. Immunohistochemistry (IHC) and cell counting was performed to analyze cellular tropism of vectors. Results from wide-field fundus images shows that AAV2/8 and AAV2/2 Quad serotypes generate GFP fluorescence. AAV2/8 serotype produced more GFP fluorescence in comparison to the others, which indicates that it is more efficient transducing the GFP gene. Results: Pending results from IHC and cell counting. Discussion/Conclusion: To be added.

CONSTRUCTION OF AN NRSF MAMMALIAN EXPRESSION VECTOR

Christina Casali
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 90
Time: 3:15 PM - 5:00 PM
Mentor(s): Christina Chan (Chemical Engineering & Materials Science), Ryan Thompson (Cell & Molecular Biology)

The neuronal restrictive silencing factor, or NRSF gene, controls the neuronal phenotype in cells by controlling the expression of hundreds of neural genes. When silenced, NRSF induces neuronal differentiation of mesenchymal stem cells(MSCs). The overall goal of this project is to study the regulation of the NRSF gene in MSCs. The NRSF gene must be cloned out of DNA and reinserted into a pcDNA3 expression vector in order to be transformed into the MSCs. The NRSF gene was cloned through PCR and confirmed through agarose gel electrophoresis. A restriction digestion was performed on the cloned DNA and its products were also confirmed through electrophoresis. The NRSF gene was prepared for directional cloning into the pcDNA3 vector by double digesting NRSF and pcDNA3. The DNA fragments were then ligated using T4 DNA ligase and the ligation products were transformed into *E. coli* using heat shock transformation and amplified. The plasmids were isolated and digested to confirm their identities. The NRSF vector was then cloned into the pcDNA3 vector to produce a plasmid that will overexpress NRSF in mammalian cells.

OPTIMIZATION OF BEHAVIORAL VISION TEST FOR DAY-BLIND DOGS

Jennifer I Rivera-Aviles & Joshua Laske
Home Institution: University of Puerto Rico at Mayaguez, Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 91
Time: 3:15 PM - 5:00 PM
Mentor(s): Andras Komaromy (Small Animal Clinical Sciences)

Achromatopsia is a congenital autosomal recessive cone function disorder resulting in complete color and day-blindness as well as decreased visual acuity. Our laboratory studies a spontaneous canine disease model, and we have recently developed an effective treatment in these dogs using viral-mediated gene therapy. Evaluation of cone function and day vision in achromatopsia-affected dogs is important for the diagnosis of the disease and the assessment of therapy outcome. We have previously constructed an obstacle course (OC) for dogs that allows the objective assessment of the dogs' sight under different light conditions. Recently, we have observed that day blind dogs, when tested frequently, began using other senses to master the OC efficiently, even under blinding light conditions. The purpose of this study is to create a better vision test, that the dogs will not be able to navigate perfectly using non-visual senses. More challenging obstacles will be used in order to increase the difficulty level: (1) The position of the existing obstacle panels will be randomized and changed with each trial; and (2) new obstacles will be added so that canines may be unable to avoid them if they cannot see. The dogs will not be able to use non-visual senses to get across the maze. By constantly changing the location of obstacles, we ensure that the dogs will be unable to memorize the course, making this a purely visual based trial. Dim (0.2 lux) and bright (646 lux) ambient light conditions will be used to test the dogs.

ANALYSIS OF THE REGULATION AND STABILITY OF PRR7 IN THE CIRCADIAN CLOCK OF ARABIDOPSIS THALIANA

Katerina Lay
Home Institution: Clemson University
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 92
Time: 3:15 PM - 5:00 PM
Mentor(s): Eva Farre (Plant Biology), Tomomi Takeuchi (Plant Biology)

The circadian clock is the internal regulator of 24-hour time that is found in almost all higher level organisms. In plants, the circadian clock is made of three interlocked transcriptional feedback loops. One of these loops consists of four transcription factors: CIRCADIAN CLOCK ASSOCIATED (CCA1) and LATE ELONGATED HYPOCOTYL (LHY), which induce and are repressed by PSEUDO-RESPONSE REGULATOR 7 (PRR7) and PSEUDO-RESPONSE REGULATOR 9 (PRR9). PRR7 loss or overexpression causes compromised circadian rhythms and it is posttranslationally regulated. The goal of this research is to analyze the regulation and stability of PRR7 in the model organism Arabidopsis thaliana. To identify the regulator of PRR7, Arabidopsis lines engineered to constitutively express PRR7 fused to firefly LUCIFERASE via a 35S promoter have been mutagenized with ethyl methanesulfonate to induce point mutations. In wild-type Arabidopsis, PRR7 protein levels oscillate in a sinusoidal manner, but we expect that a plant with a mutation in its PRR7 regulator to have consistently high levels of PRR7. I am measuring luciferase protein expression using a luminometer and screening for mutants with this abnormal activity. To examine the stability of PRR7, I am infiltrating Arabidopsis lines that express 35S::PRR7-LUCIFERASE with cycloheximide to stop the translation of the PRR7-LUCIFERASE transcript prior to degradation. I will then measure levels of luciferase protein to see how degradation progresses under different light conditions. If successful, this method will be used to understand PRR7 protein degradation in different light qualities and intensities.

THE EFFECT OF METHYLMERCURY (MEHG) ON RNA EXPRESSION OF CALCIUM PERMEABLE ION CHANNELS IN DIFFERENTIATED AND UNDIFFERENTIATED F11 CELLS

Kia-Zolee Perez-Vale
Home Institution: University of Puerto Rico at Arecibo
Category: Cell Biology, Genetics and Genomics, Section 3
Poster: 93
Time: 3:15 PM - 5:00 PM
Mentor(s): William D. Atchison (Veterinary Medicine), Heidi E. Hannon (Comparative Medicine & Integrative Biology)

Methylmercury (MeHg) is a globally-distributed environmental contaminant that bioaccumulates in the aquatic food chain making it of great concern because eventually it will enter the human diet. Exposure to MeHg causes damage to the peripheral and central nervous systems, producing sensory neuropathies and ataxia, and can contribute to the development of neurodegenerative diseases. Although the mechanisms of MeHg neurotoxicity are not fully understood, MeHg exposure can result in disruption of protein synthesis, ionic regulation and neuronal excitability. MeHg exposure elevates the levels of intracellular Ca^{2+} concentration ($[Ca^{2+}]_i$) in two phases. Phase one consists of Ca^{2+} released from intracellular storage organelles, such as the endoplasmic reticulum and mitochondria. Phase two (P2) results from an influx of Ca^{2+} through ion channels. Investigators have expressed that cell death is preceded by elevated levels of $[Ca^{2+}]_i$ explaining how MeHg ultimately can cause cell death. However, the application of Ca^{2+}channel antagonists slows the onset of P2 and cell death following MeHg exposure, suggesting expression of Ca^{2+}-permeable membrane proteins makes cells susceptible to MeHg-induced cytotoxicity. In this study, we will investigate how in vitro MeHg exposure of F11 cells affects the RNA expression of high-voltage Ca^{2+} channels, low-voltage Ca^{2+} channels and Transient Receptor Potential Ankyrin 1, through RT-PCR assay. The reason to use this cell line is to immortalize the gene products of single neurons that are sensitive to MeHg. Under those circumstances, changes in RNA expression may suggest which Ca^{2+} permeable ion channels make DRG-like neurons more susceptible to the neurotoxicity of MeHg.

EVALUATION OF IMMUNOMODULATORY PROPERTIES OF MESENCHYMAL STEM CELLS

Jean Lafontaine Rivera
Home Institution: University of Puerto Rico at Rio Piedras
Category: Cell Biology, Genetics and Genomics, Section 4
Poster: 94
Time: 3:15 PM - 5:00 PM
Mentor(s): Vilma Yuzbasiyan-Gurkan (Canine Genetics)

Immune-mediated inflammatory diseases (IMIDs), like asthma, arthritis and allergies, are caused by the dysregulation of inflammatory pathways, which may lead to abnormal productions of inflammatory cytokines. Mesenchymal stem cells (MSCs) are known to posses immunomodulatory properties. This action of MSCs is mediated in large part by release of interleukins IL-6 and IL-10, which have anti-inflammatory properties. The objective of this project is to determine if MSCs release these interleukins at rest and under a simulated asthmatic environment. We will measure the amount of expression of IL-6 and IL-10 both at the RNA and protein level. We will use quantitative PCR to evaluate gene expression, and enzyme-linked immunosorbent assay, ELISA, to verify if the transcribed genes are being translated into the IL-6 and IL-10 proteins. This will be done before and after inducing conditions mimicking an inflammatory environment in cultured MSCs,to verify if there is a significant difference in the production of these cytokines. We expect to see an increase in the production of the pro-inflammatory cytokines in conditions that mimic the pro-inflammatory environmnent. Primary MSCs isolated from cats and dogs are available in the laboratory of Dr. Yuzbasiyan-Gurkan. If there is time, the immunomodulatory effects of MSCs among different species will be compared.

VITAMIN B12 MALABSORPTION WITH PROTEINURIA IN BORDER COLLIES

Shelby Hemker
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 4
Poster: 95
Time: 3:15 PM - 5:00 PM
Mentor(s): John Fyfe (Microbiology & Molecular Genetics)

Vitamin B12 malabsorption accompanied by low molecular weight proteinuria is an autosomal recessive disorder previously described in dogs including border collies (BC). The resultant vitamin deficiency causes dyshematopoiesis, weakness and lethargy, failure to thrive, and hyperammonemia in the juvenile period. Recently, we ascertained a 19-member BC family including 4 affected dogs. DNA samples were genotyped on the Illumina® canine 170 K HD SNP array for homozygosity mapping. One 2.9 Mb region of homozygosity common to the affected dogs was discovered on dog chromosome 2. The region included CUBN, a gene that encodes a component of the intrinsic factor-vitamin B12 receptor in intestine and kidney tubules. Therefore, we PCR amplified and sequenced all 67 CUBN exons with flanking splice sites of an affected dog and his dam. We found a single base deletion in exon 53 that predicts a frameshift and early truncation of the protein. Alleles of the putative mutation site segregated with the deduced disease alleles in the 19-member BC family, relatives of the BC family,

and sporadic cases. It was not observed in 25 unrelated BC. We expect reduced CUBN mRNA in affected dogs because the early stop codon may cause nonsense mediated decay. We are currently testing this hypothesis by quantitating CUBN mRNA in ileum and kidney via quantitative-reverse transcriptase PCR. We are also collecting DNA samples from additional cases of the BC disorder locally and worldwide. A convenient carrier test has been designed to allow BC breeders to avoid producing affected dogs in the future.

HIGHLIGHTING THE ROLE OF RHD3/ACTIN GENES IN CELL WALL COMPOSITION

Nicole Mannino
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 4
Poster: 96
Time: 3:15 PM - 5:00 PM
Mentor(s): Federica Brandizzi (Plant Biology), Giovanni Stefano (Plant Biology)

In Arabidopsis thaliana, RHD3 (Root Hair Defective3) has been shown to reduce wall thickness of fibers, vessels, pith cells, Golgi motility, and affect the cytoskeleton organization. Actin, a component of the cytoskeleton, contributes to the growth and intracellular trafficking of the cell. Mutations within these genes have been shown to cause reduced Golgi motility, reduction of the cell wall, and defects in root hair development. Since both actin and RHD3 are required for organelle motility, cell wall composition and hair growth, we combined mutations in four genes ACT2 (act2-1), ACT7 (act7-4), ACT8 (act8-2), and RHD3 to determine the stages at which these genes contribute to the defects shown. Triple mutated plants displayed visible defects of the siliques, stems, and branches which were twisted. The size of the plants were dwarfed as well. From literature, these phenotypes are related to defects in cell wall deposition. The use of this triple mutant will be very important to bioenergy research because any mutation affecting positively the cell wall composition will improve its digestibility.

STABILITY IN PHAGE LAMBDA AS AN EVOLUTIONARY TRADE-OFF

Rachel Sullivan
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 4
Poster: 97
Time: 3:15 PM - 5:00 PM
Mentor(s): Alita Burmeister (Microbiology & Molecular Genetics)

Evolutionary trade-offs occur when an adaptation, which is a beneficial trait, constrains another adaptation. We hypothesize that such a trade-off exists between fitness and stability for phage λ, such that isolates with greater fitness are less stable than the ancestor λ. To test this hypothesis, we will compare the fitness and stability of several λ isolates that have evolved to different points. We will compete the ancestor and the evolved λ to measure fitness, and we will perform decay rate analysis to measure stability. We predict that there will be an inverse relationship between the fitness and stability in the λ isolates.

CIRCADIAN OSCILLATOR EXPRESSION FOLLOWING NIGHT TIME LIGHT EXPOSURE

Emily Chambers
Home Institution: Lehigh University
Category: Cell Biology, Genetics and Genomics, Section 4
Poster: 98
Time: 3:15 PM - 5:00 PM
Mentor(s): Lily Yan (Psychology)

In humans, disturbances to the daily behavioral rhythm, such as chronic jet lag or shift work, can contribute to cognitive malfunction and diseases such as cancer and obesity. In mammals, the circadian rhythm is controlled by a central pacemaker in the hypothalamus, the suprachiasmatic nucleus (SCN). The SCN uses multiple types of environmental cues to control biological processes, although the most salient cue is light exposure. The objective of this study is to investigate the effects of chronic night time light exposure on the time-keeping function of the SCN. This investigation will further clarify how human lifestyles that require night time light exposure affect the brain to cause health issues. The study used a control group of mice that experienced 12:12 h light:dark (LD) conditions, while the experimental group of mice experienced 12:4:4:4 h light:dark:light:dark (LDLD) conditions to replicate night time light exposure in humans. The mice were sacrificed at four-hour intervals of the daily cycle and were examined for vasoactive intestinal polypeptide (VIP) and the protein products of genes Period 1 (Per1) and Period 2 (Per2). Normal photic entrainment of the SCN produces oscillations of Per1 and Per2 that maintain circadian rhythmicity, while VIP expression has also been implicated in the entrainment of circadian rhythmicity through the synchronization of cells in the SCN. Therefore, investigation of the expression of these signals may provide insight into how the SCN is affected by chronic night time light exposure.

WOUND-RESPONSE ASSOCIATED CIS-REGULATORY ELEMENTS IN ARABIDOPSIS THALIANA

Mathew Simenc
Home Institution: Humboldt State University
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 99
Time: 3:15 PM - 5:00 PM
Mentor(s): Johnny Lloyd (Plant Biology), Nicholas Panchy (Genetics)

Plant wound stress is a major cause of reduced crop output. It is known that herbivory and mechanical wound stress cause differential transcriptional responses in plants, and previous studies have demonstrated the existence of putative cis-regulatory element (pCRE) motif superfamilies and their implications in the regulatory logic of transcriptional response to biotic and abiotic stresses in Arabidopsis thaliana. However, few pCREs have been uniquely associated with genes responsive to herbivory stress. Using transcriptional data from several DNA microarray experiments involving subjection of A. thaliana (Col-0 wild-type) to herbivory and mechanical wounding, genes determined to be responsive will be mapped to A. thaliana genome and a motif-finding pipeline will be used to identify pCREs in promoter regions and introns. This study will expand upon previous studies by analyzing data from a greater number of experiments involving herbivory and mechanical wound stress and by increasing the range of the pCRE search algorithms to include genomic regions not previously investigated.

REPLICATIVE SENESCENCE OF SACCHAROMYCES CEREVISIAE

DaShayla Bradford
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 100
Time: 3:15 PM - 5:00 PM
Mentor(s): Barry Williams (Zoology)

Senescence is a degenerative process that all organisms experience and with senescence comes the responsibility of passing genetic inheritance from one family member to another as many times as possible to extend the ancestral tree. However, there has always been the question of why does senescence contrast negatively with reproduction rate? To answer this question, I will be conducting an experiment on Saccharomyces Cerevisiae, yeast, to determine how replicative aging affects yeast cells' reproduction and growth rate. To conduct this experiment, several mutant virgin mother yeast strains were used so that a numerous amount of tetrad dissections were performed until the mother cells were unable to reproduce any further. A life span data sheet was used to collect the number of daughter cells each mother cell produced and how long it took them to stop reproducing, which was then converted into a survival curve and growth curve. The results could be interpreted for us to understand why the evolutionary trade-off of senescence and reproduction rate is not a typical mutation that helps with survival. The findings of this study can help us better understand the why the longevity of the human lifespan is not a universal mutation.

THE INVESTIGATION OF ESCHERICHIA COLI'S POTENTIAL AS A NEW SPECIES

Maia Rowles
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 101
Time: 3:15 PM - 5:00 PM
Mentor(s): Zachary Blount (Microbiology & Molecular Genetics)

Experimental evolution has broad application that allows scientists to determine how nature adopts beneficial or detrimental traits. Scientists are researching and developing an understanding of evolution and how it affects organisms that could potentially allow for a cure and sustainable treatment of these afflictions. This experiment will be investigating the speciation and ecological aspects of evolution regarding *Escherichia coli*. *E. coli* is known for its ability to exclusively survive on glucose, however through the previous research of long term inoculation and the transfer series of the Cit- species, evidence has shown a change in the species' behavior where surviving on citrate has become more valuable over time. This "evolutionary novelty" has led to the renaming of these specific bacterial revertants as Cit+. An evolutionary novelty can be defined as a new trait or behavior that has developed and provided a microorganism with a new function. This experiment involves the competition of the Cit- parent and Cit+ revertant in a liquid medium called DM25 glucose. After the competition of the parent and revertant are plated on tetrazolium arabinose petri dishes, the plates are incubated, and the new colonies are then counted. The data extracted was statistically analyzed to find a fitness ratio of 1:1 which gives support to the Cit+ revertant's neutrality. This neutrality supports evidence that these Cit+ revertants are potentially new species. The outcome of this research could provide solutions with significant medical application as well as provide the scientific community with answers to an ever changing ecological system.

THE EVOLUTION OF ESCHERICHIA COLI FROM CIT- TO CIT+

Kiyana Weatherspoon
Home Institution: Michigan State University
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 102
Time: 3:15 PM - 5:00 PM
Mentor(s): Zachary Blount (Microbiology & Molecular Genetics)

Studying the evolution of an organism allows us to draw implications about certain processes that can be used as a reference for all organisms. This is significant because we as organisms are constantly changing. Knowing how different aspects affect the evolution of an organism could shed light on how mutations are acquired and can even allow for an organism to develop a completely new ability not known to that certain species. Part of what classifies Escherichia coli as a species is its inability to grow on citrate. This study was done to find neutral revertants to further prove that a strain of Escherichia coli is a new species because it has developed the ability to grow on citrate. This was done by competing cit+ parents (clones that have the ability to grow on citrate) against cit- revertants to find neutrality between the two. The competitions were done over a seven day period which allowed us to compare day 0 with day 1 and 3. The only difference wanted was for the cit+ parent to mutate and make cit- revertants. After this process was completed, we were able to determine neutrality by finding different values such as the average and p-value using results from a t-test. After assessing numerous amounts of data, neutrality was found amongst most of the tested clones allowing for us to proceed with finding further evidence that these *E. coli* that can grow on citrate are indeed a new species.

PRODUCTION OF NOVEL SOYBEAN GENOTYPES THAT OVEREXPRESS LEC2 AND DGAT1

Jonathan Turkus
Home Institution: Hope College
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 103
Time: 3:15 PM - 5:00 PM
Mentor(s): Mariam Sticklen (Plant, Soil & Microbial Sciences)

The goal of this study is to develop two soybean (Glycine max) genotypes that overexpress either Arabidopsis thaliana Leafy Cotyledon 2 (LEC2) and A. thaliana diacylgylcerol acyltransferase 1 (DGAT1). Soybean is a major triacylglycerol (TAG) oil crop, but only produces high oil levels in its seeds. Since LEC2 is a master regulators of TAG accumulation and DGAT1 is the gene that synthesizes TAG, we are interested in utilizing these genes to increase the TAG content in soybean tissues. An increase in the amount of raw TAG a single plant produces would likely translate to greater quantities of TAG-derived products, such as biodiesel, being manufactured. Constructs containing LEC2 and DGAT1 cDNAs from Arabidopsis will have transgenes expression regulated by the constitutive rice-actin promoter. The DGAT1 and LEC2 constructs will be mixed in a 1:1:1 ratio with another construct containing bar (an herbicide resistance gene) and be bound to tungsten micro-particles in 2M calcium chloride solution and coated with spermidine. The constructs will be introduced into in vitro-grown soybean multiple shoot primordia and pre-embryos of the 'Jack' soybean variety using gene gun bombardment technology. After a short recovery period, pre-embryos will be transferred to media containing Liberty herbicide. As bar provides resistance to the herbicide's active ingredient, glufosinate ammonium, only transgenic cells expressing the construct should survive. A portion of transgenic pre-embryos will be sacrificed to have DNA extracted and tested for LEC2 and DGAT1 by polymerase chain reaction followed by gel electrophoresis.

MAP-BASED IDENTIFICATION OF A REGULATORY GENE IN ARABIDOPSIS

Monica Tran
Home Institution: JW Sexton High School
Category: Cell Biology, Genetics and Genomics, Section 5
Poster: 104
Time: 3:15 PM - 5:00 PM
Mentor(s): Steve VanNocker (Horticulture)

DNA is like a blueprint, a very long blueprint, that needs to be packaged in order to fit into the nucleus. PAF1 (a transcriptional cofactor) is one of the many factors that is involved in packing and unpacking the genome. PAF1 is made of five proteins that are conserved among life forms like humans and plants. In the Arabidopsis plant, mutation or loss of PAF1 proteins causes abnormal flowering, floral development, and other development defects, whereas loss of PAF1 in humans is associated with various cancers. VIP7 is a novel gene that is required for the function of PAF1. However, VIP7 has not been identified in plants or humans. And understanding how PAF1 and VIP7 works in plants will extend our understanding of the etiology of cancers. We are trying to locate VIP7 using genetic mapping. This is done by using various molecular markers on DNA to find recombinants to lead us closer to the mutant gene. Results of this project will be presented.

CHEMICAL ENGINEERING & MATERIALS SCIENCE

PAPER COATINGS DERIVED FROM SILYLATED SOYBEAN OIL EMULSIONS

Anthony Garvert
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 105
Time: 1:00 PM - 2:45 PM
Mentor(s): Sudhanwa Dewasthale (Chemical Engineering), Elodie Hablot (Chemical Engineering), Ramani Narayan (Chemical Engineering)

In the Navy, there has been an increased interest in creating a paper trash bag with a hydrophobic coating on the inside to prevent leakage. This coating will be created with the intent for the trash bag and its contents to be biodegradable in an aqueous setting. If this trash bag and the coating are successfully implemented, a solution can be offered to help reduce the carbon footprint in the environment. The overall objective of this project is to prepare and characterize hydrophobic paper coatings from modified soybean oil emulsions. In this work reactive silane (Vinyl trimethoxysilane - VTMOS) is first grafted onto the double bonds of the unsaturated fatty acids in the soy triglycerides. The oil, along with water and an ionic surfactant, is then emulsified using a common homogenizer to produce stable oil in water suspensions, which upon evaporation of the water phase yield crosslinked films. This emulsion will be coated onto the paper and tested for hydrophobicity. Key aspects of this work include determining the ratio of soybean oil to VTMOS, optimizing the reaction conditions required to obtain high degree of grafting and measuring the properties of the coatings, determining a surfactant that will effectively create a stable emulsion from the modified soybean oil and water, and determining the best ratio of oil to water required to produce a stable emulsion.

SYNTHESIS OF HYDROPHILLIC SILOXY BASED POLYMERS AND COPOLYMER EMULSIONS

Caleb Andrews
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 106
Time: 1:00 PM - 2:45 PM
Mentor(s): Sudhanwa Dewasthale (Chemical Engineering & Material Science), Elodie Hablot (Chemical Engineering & Material Science)

In this research we investigated the preparation of various compositions created from aminosilanes and cyclic carbonates. Some of these compositions are water insoluble and were polymerized in emulsions, while others are soluble in water and were used in aqueous solutions. In general, polymerization is obtained by hydrolyzing the alkoxy groups on the silane monomer using 1M HCL solution as a catalyst followed by condensation of the silanols. The molecular weight and the degree of condensation are controlled by the time period the sample is placed under vacuum to remove the alcohol by-product. Trifunctional monomers such as trietoxyaminosiloxy (TECOH) are capable of branching and eventual gelling, so care must be taken to terminate the reaction before the gel point. Difunctional monomers like dietoxyaminosiloxy (DECOH), on the other hand, can be polymerized to high molecular weight gums that are still soluble in water. Both the aqueous solutions and the copolymer emulsions were then subject to characterization tests. The emulsions and solutions were tested using Brookfield viscosity tests, FTIR, 1H-NMR, DSC, and TGA as well as an oil repellant (hydrophillic) migration test.

METHOD DEVELOPMENT FOR QUANTIFYING WATER SWELLING BEHAVIOR OF PRETREATED GRASSES AND THE RELATIONSHIP BETWEEN ENZYMATIC DIGESTIBILITY FOR THE PRODUCTION OF CELLULOSIC BIOFUELS

Tim Magee
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 107
Time: 1:00 PM - 2:45 PM
Mentor(s): David Hodge (Chemical Engineering), Dan Williams (Chemical Engineering)

Characterization of cell wall properties of corn stover and switchgrass is important for the advancement of biofuels and other green chemical processes. Plant cell walls have the ability to absorb water, which makes them a swellable hydrogel. A correlation has been found between water swelling capacity and the enzymatic digestibility of biomass. Water swelling capacity is the weight of water remaining in biomass after it has been centrifuge drained under specified conditions, divided by the weight of dry biomass in a sample. The method involves washing and vacuum drying 6g of biomass samples in a fabricated Buchner funnel containing a 200mesh screen bottom, then centrifuging a smaller sample of this biomass in a modified spin column also containing a 200mesh screen bottom at some specified spin speed and duration. The moisture content of the biomass after centrifuging is then determined and used to calculate the water swelling capacity. This work will focus on scaling down the 6g of sample required at the initial step to100 milligrams of sample and determining if the

method is consistent at this smaller scale. This would allow for water swelling capacity screening of biomass that is more difficult to obtain in larger quantities. In addition, this smaller scale method will be used to determine the impact of biomass pelletization on water swelling of biomass, which could have an ultimate impact on enzymatic digestibility.

ELECTROSTATIC BINDING CAPACITIES OF MESOPOROUS SILICA NANOPARTICLES FOR USE IN SIRNA THERAPEUTICS

Sean Norton
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 108
Time: 1:00 PM - 2:45 PM
Mentor(s): Daniel Vocelle (Chemical Engineering), S. Patrick Walton (Chemical Engineering)

Protein overexpression is a cause or effect of many disease states. Thus, therapeutic approaches that can specifically target and reduce the expression of particular unregulated proteins have great potential. One molecular approach being developed for this type of therapy is called short interfering RNA (siRNA). siRNAs use the natural RNA interference (RNAi) pathway to reduce the expression of a given protein by destroying its messenger RNA (mRNA). The mechanism is as follows: once in the cell, the siRNA binds to the proteins of the RNAi pathway, which, after processing the siRNA, can then target and degrade the mRNA from which the targeted protein is made. However, siRNAs on their own are unable to enter cells. Nanoparticles are currently being studied as a means of efficiently delivering siRNA. My research focuses on developing mesoporous silica nanoparticles of different chemistries that can be used to deliver siRNA to cells. My specific goal has been to determine the relationship between the strength of binding of siRNAs to these nanoparticles and the eventual silencing activity of the siRNAs when delivered by each unique nanoparticle.

THIN HYDROGEL FILMS FOR SPINAL CORD REPAIR

Kayla Felger
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 109
Time: 1:00 PM - 2:45 PM
Mentor(s): Jeff Sakamoto (Chemical Engineering & Materials Science)

Currently, 200,000 people in the United States are living with the devastating disease of paralysis caused by spinal cord injury. Lifetime costs for this disease range from $500,000-$3 million, and no treatment is known. The purpose of this work is to develop a viable therapy to treat paralysis by inducing spinal cord neuron growth. Neurons do not regenerate spontaneously, and any slight growth is unorganized. Therefore, neurons must be both stimulated with growth factors as well as provided with structural guidance to maintain linear orientation. Although some drug delivery vehicles exist, they often show a problematic burst release. In this work, thin hydrogel films were fabricated to provide both drug delivery and guidance. The films, ranging from about 100-300 microns thick, were formed through a process of dehydration followed by slight rehydration with cross-linking solution. When loaded with lysozyme, the films exhibit a controlled and substantial release for seven weeks. To test the efficacy, nerve guidance scaffolds were engineered by drilling linear channels into stacked films. One additional advantage of the thin film scaffolds is that they biodegrade gradually to allow maximal space for recovery. Because thin film scaffolds integrate drug delivery capability, guidance, and biodegradability, they have potential to significantly increase neuron regeneration.

THE APPLICATION OF YEAST DISPLAY IN CANCER RESEARCH

Manuel Henry
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 110
Time: 1:00 PM - 2:45 PM
Mentor(s): Jim Stapleton (Chemical Engineering & Material Science), Tim Whitehead (Chemical Engineering & Material Science)

Wouldn't it be remarkable if science developed the technology to detect the exact place of cancerous cells in the human body? While many may think that this is a complete stretch and out of the realm of scientific capability at the time, they are incorrect. Through research, scientists have discovered that cancerous cells have high concentrations of certain proteins in them; one of these is the protein EpCam. The first milestone that we have to reach is cloning the protein and backing plasmid. We will be taking two Ecoli. plasmids, Petcon Cohesin and Puc57 EpCam. Through digestion and ligation our plasmid of interest, Petcon Epcam, will be created. Once this has be achieved the newly cloned plasmid will then be transformed into yeast cells and the protein EpCam will then be displayed. This is important because specific antibodies can be used to connect directly to the EpCam protein. The objective of this study is to use the yeast display to express EpCam and find where the antibody binds to the protein. If this can be successfully accomplished cancer research as we know it

would be revolutionized. Through research, our main goal is to see exactly where the antibody binds to the protein. If achieved, this research will make for an easier removal of cancerous cells from a given patient.

RIGID POLYURETHANE FOAMS BASED ON SOYMEAL POLYOLS

Brandon DuQuette
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 1
Poster: 111
Time: 1:00 PM - 2:45 PM
Mentor(s): Ken Farminer (Chemical Engineering & Material Sciences), Dan Graiver (Chemical Engineering & Material Sciences), Elodie Hablot (Chemical Engineering & Material Sciences), Ramani Narayan (Chemical Engineering & Material Sciences)

Most polyols, both made from renewable resources and suitable for polymerization into polyurethane resins have been prepared from vegetable oils. Only limited effort has been directed toward using protein biomass due to difficulties processing the meal and proteins high moisture sensitivity. We avoided these problems by: (1) hydrolyzing the meal to individual amino acids, (2) protecting the carboxylic acid by reaction with ethylene diamine and (3) converting the amines to hydroxyl terminated urethanes by reaction with ethylene carbonate. This final polyol was further propoxylated to decrease its viscosity and increase its hydroxyl value and prepare it for rigid foam formulation. To optimize the number of steps followed in our chemical pathway we have prepared a range of polyols by direct carbonylation of the intermediates obtained after the hydrolysis step. We wish to detail synthesis strategies for polyols from soymeal, dried distiller grains and proteins from algae. A model compound was first developed from glycine to prove the potential reaction of ethylene carbonate with the amine groups present in amino-acids. The reaction was run in water with 5%wt of NaOH, used as a catalyst. Nuclear magnetic resonance (NMR) showed that 30% of ethylene carbonate was grafted on the amino groups of glycine. Carbonylation was also followed by a significant decrease of viscosity. This carbonylation reaction was then applied on amino-acids obtained by hydrolysis of the several resources described above and were characterized in terms of amine values, acid values, hydroxyl values. Similar results were obtained for the different polyols synthesized.

CAPACITIVE DEIONIZATION OF SALT WATER USING GRAPHENE PAPERS

Adam Wingate
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster: 112
Time: 1:00 PM - 2:45 PM
Mentor(s): Lawrence Drzal (Chemical Engineering & Material Science)

As global populations continue to grow, the need for fresh, potable water increases annually. Desalination of ocean water proves a viable and popular method to meet the growing water requirements. While many desalination processes exist, capacitive deionization (CDI) exhibits better energy efficiency than most other technologies. In CDI, water passes across porous electrodes where ions in solution are absorbed. Here, we investigated paper-like membranes composed of graphene nanoplatelets as potential electrodes for CDI. After establishing a baseline for both the in plane and through plane conductivities, as well as examining the surface topography, the papers were used in a custom made batch apparatus to test their deionization behavior. Salt water at a known concentration was introduced to the system where they were exposed to two papers at known voltage for a set amount of time. The conductivity of the effluent was then used to determine the salt concentration and salt removal.

SYNTHESIS OF HYDROGEL MICROBEADS THROUGH MICROFLUIDIC FLOW FOCUSING

Andrew Young
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster: 113
Time: 1:00 PM - 2:45 PM
Mentor(s): Maddalena Fanelli (Chemical Engineering), Peter Lillehoj (Mechanical Engineering)

Microfluidics has become an integral part of the pharmaceutical, biomedical, and life science fields. Covering a wide range of applications, microfluidics enables continuous processing of chemical and biological species and compounds that can significantly enhance drug discovery, manufacturing, and delivery. The current research investigates the application of a flow focusing microfluidic platform to synthesize calcium alginate microbeads through external gelation. Because of their porous hydrophilic polymer networks, calcium alginate hydrogels are widely used as drug and cell carriers. In this study, a microfluidic device was designed using Gambit (CAD software) and fabricated using well-established MEMS processes. To help characterize the synthesis process, the viscosity of the feed fluids (soybean oil and sodium alginate solutions) was measured using a vibro viscometer. Hydrogel microparticles of varying diameter and morphology were formed by changing the flow rates and concentrations of the sodium alginate and soybean oil solutions. Particles were characterized by optical microscopy and through diffusion experiments.

DEVELOPING OF AN ATP SENSING BIOSENSOR

Darryl Lopez
Home Institution: University of Puerto Rico at Cayey
Category: Chemical Engineering and Materials Science, Section 2
Poster: 114
Time: 1:00 PM - 2:45 PM
Mentor(s): Greg Swain (Chemistry)

Trying to detect ATP electrochemical signals in humans has always been a challenge to science. We are trying to develop a stable and selective ATP enzyme coated biosensor that can monitor in the long term ATP signals on some parts of the human body. We are going to do tests in electrochemistry with techniques such as cyclic voltammetry and linear swept voltammetry with a Platinum electrode that will have a polyphenol layer that will have the enzymes on top of it. First we use Hydrogen peroxide in a bare electrode to see if it can take those signals and have a reproducible work with it, because when we put the enzymes Hex and Gox and the polyphenol the ATP will send a Hydrogen peroxide signal similar as the one we obtained first. That way we will have data of the ATP concentration and how it is reacting. By the end of the project we hope to have the electrode working, and it will be good to science because it will be an electrode that does not have much interference and will have clear data, so we will have more information about ATP biosensors. We think is going to be a good thing to science because there is a clear need for highly stable and selective measurements of ATP that have good temporal and spatial resolution for measurements in complex biological matrixes.

MEASURING THE ELECTROCHEMICAL PROPERTIES OF LANTHANUM STRONTIUM IRON OXIDE USING A DILATOMETRY RELAXATION METHOD

Laura M. Bartow
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster: 115
Time: 1:00 PM - 2:45 PM
Mentor(s): Jason D. Nicholas (Chemical Engineering & Materials Science), Qing Yang (Chemical Engineering & Materials Science)

In recent years, increasing attention has been focused on solid oxide fuel cells (SOFCs) as electrochemical conversion devices due to their high efficiency (1, 2) and energy density (3). Mixed ionic electronic conducting (MIEC) materials, whose perovskite structure allows for a high concentration of oxygen vacancies and oxygen mobility (4), make excellent, low-cost cathode materials for SOFCs (1). Perovskite structures exhibit chemical expansion with changes in temperature and oxygen partial pressure (5). Therefore, these materials provide a method for studying chemical diffusion *in situ* by monitoring changes in their dimensions in response to varying temperature and oxygen partial pressure. In this way, the electrochemical properties of the MIEC $La_{0.6}Sr_{0.4}FeO_{3-\delta}$ (LSF64), including chemical diffusion ($\widetilde{D}$) and surface exchange coefficients (k) and thermo-chemical expansion (ε_{T+C}), are examined. LSF64 was prepared through the glycine-nitrate process (6) and calcined at 1000°C for 5 h. Samples for dilatometry were uniaxially pressed followed by isostatic pressing, and sintered at 1500°C for 30 minutes to increase the density of the samples. Dilatometry relaxation experiments were carried out in a Netzsch 402C Dilatometer. The oxygen partial pressure was varied from 0.021-0.21 atm at temperatures ranging from 800-1200°C. Preliminary results showed reproducable dilatometry relaxation curves. From these relaxation curves, a two-dimensional solution to Fick's second law, as shown below (7), was applied in order to solve for $\widetilde{D}$ and *k*.

$$\frac{\varepsilon(x,t)-\varepsilon_o}{\varepsilon_\infty-\varepsilon_o}=\frac{c(x,t)-c_o}{c_\infty-c_o}=1-\left[\sum_{n=1}^{\infty}\frac{2(\beta_n tan\beta_n)^2\exp\left(-\frac{\beta_n^2\widetilde{D}(t-t_o)}{a^2}\right)}{\beta_n^2(\beta_n^2+tan\beta_n)^2+\beta_n tan\beta_n}\right]^2$$

SYNTHESIS OF GARNET ENERGY MATERIALS WITH HYDROGEL TEMPLATING

Thomas Heuser
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster: 116
Time: 1:00 PM - 2:45 PM
Mentor(s): Jeff Sakamoto (Chemical Engineering & Material Science), Travis Thompson (Chemical Engineering & Material Science)

With increasing demand for electric vehicles, there has been a significant increase in the need for new materials for advanced battery technologies. The purpose of this work is to examine the ceramic material Lithium Lanthanum Zirconium Oxide (LLZO), for its potential both as a thermoelectric material and as an electrolyte material. LLZO could be useful in lithium-ion batteries because of its high lithium-ion conductivity, and its high stability against metallic lithium dendrite growth. Scaling the production of LLZO to the levels required for commercialization requires a new synthesis process that is capable of producing kg scale batches. Hydrogel Templating, the synthesis technique used for the production of LLZO, is capable of

producing large quantities of highly phase-pure material very quickly. It is simple and easily scalable, and could be easily adapted to continuous processing. One type of hydrogel that is particularly promising is polyethylene glycol (PEG). PEG is promising because it quickly cross-links with exposure to ultraviolet light. PEG crosslinking with UV light is already widely used in polymer processing, and so is already well documented and understood. The powders produced by the Hydrogel Templating method can be consolidated into pellets using a newly developed sintering technique called Rapid-Induction Hot Pressing (RIHP). RIHP is extremely fast, and is capable of producing samples with >99% density. In this work, the properties of the LLZO samples produced using Hydrogel Templating and RIHP will be characterized with variety of electrochemical testing procedures in order to evaluate suitability as either electrolytic or thermoelectric materials.

ALIGNMENT AND MYELINATION OF NEURONS BY MODULATING ANISOTOPY THROUGH MECHANICAL AND TOPOLOGICAL APPROACHES

Ryan Pyne
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 2
Poster: 117
Time: 1:00 PM - 2:45 PM
Mentor(s): Christina Chan (Chemical Engineering & Material Science)

Each year in the United States, thousands of Americans are affected by spinal cord injury (SCI). Tissue damage from SCI occurs in two stages, a primary stage which is a direct result of trauma and a secondary stage involving necrosis and apoptosis of glial cells over the course of several days or weeks. One serious side effect of SCI is chronic progressive demyelination, which severely decreases neural function. Neuronal alignment and myelination are crucial for proper neural function. For myelination to occur, a myelinating cell must align with an axon to begin building up a myelin sheath. In the case of SCI, Schwann cells have been shown to migrate to the site of injury and begin remyelinating axons that had been demyelinated. Therefore, in order to treat SCI, it would be beneficial to have methods for impacting axonal regeneration and alignment and inducing myelination of new axons through Schwann cells. This project explores methods for alignment and myelination of neurons by modulating anisotopy through mechanical and topological approaches.

NEUTRAL SULFITE PRETREATMENT AND PELLETIZATION OF CORN STOVER AS A ROUTE FOR PRODUCING CELLULOSIC BIOFUELS

Andrew Accardo
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster: 118
Time: 3:15 PM - 5:00 PM
Mentor(s): David Hodge (Chemical Engineering & Materials Science)

The purpose of this work is to test the neutral sulfite pretreatment and pelletization of corn stover as a route for producing cellulosic biofuels. Pretreatments are needed in order to make plant cell wall polysaccharides more accessible for their use in fermentation used in the process of making biofuels. In this work, neutral sulfite pretreatment of corn stover is investigated and the effects of pretreatment temperature and time on the subsequent enzymatic digestion of the biomass are first tested. Combining pretreatment with biomass densification such as pelletization is one route that will improve the logistical challenges required for producing cellulosic biofuels. Lignin sulfonation occurs during sulfite pretreatments, and this chemical change decreases the lignin glass transition temperature, which we hypothesize will improve binding during pelletization. In response to this, a series of tests will investigate the effect of prior pretreatments, temperature, and moisture content on the effectiveness of pelletization.

CATALYST CHARACTERIZATION FOR BIO-BASED CHEMICAL REACTIONS

Evan Wegener
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster: 119
Time: 3:15 PM - 5:00 PM
Mentor(s): Dennis Miller (Chemical Engineering & Materials Science)

Replacing petroleum products with bio-based chemicals is a necessary step in reducing our impact on the environment and dependence on fossil fuels. Industrial processes are being developed to synthesize intermediates and consumer products from renewable sources. To become viable, these processes must meet the challenge of being low-cost and highly efficient. Supported-metal catalysts play a key role in these processes by increasing reaction conversion and selectivity. It is important to know catalyst physical and chemical characteristics in order to be able to design them for the best performance. In my summer project, I am measuring catalyst surface area and average pore size using the BET analysis method. A variety of techniques are used to measure catalyst chemical properties. Metal surface area and number of active metal sites can be determined through the chemisorption of either hydrogen or carbon monoxide. Temperature programmed desorption of

ammonia and carbon dioxide is used to determine acidic and basic reactive site concentration, respectively on the catalyst surface. Reaction systems currently being studied include the condensation of ethanol to 1-butanol and the conversion of propylene glycol to propylene oxide.

NANOMATERIALS AND THE BEHAVIOR OF BIOMEMBRANES

Ariana Avila
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster: 120
Time: 3:15 PM - 5:00 PM
Mentor(s): Ying Liu (Chemical Engineering & Material Science), Mark Worden (Chemical Engineering & Material Science)

The increasing manufacture of numerous engineered nanomaterials (ENM) has caused concern among government officials and the scientific community. The potential effects of utilizing ENM's to study and improve an individual's quality of life are still not clearly understood. Therefore, nanotoxicology is becoming a very popular topic when working with nanotechnology. The importance of developing a platform under which to measure and to determine the toxicity of ENM's is crucial for the future development of nanotechnology. To study and understand ENM's biological influence, biomimetic interface composed of dioleoyl-sn-glycero-3-phosphocholine (DOPC) was used to form both a planar bilayer lipid membrane (BLM) and a tethered BLM. To ensure the BLM would form and stabilize, different concentrations of the DOPC solution were tested. Once the successful formation of a BLM was determined, the next step was to expose ENM's to the BLM in order to characterize the electrical properties of the resulting BLM which could ultimately reveal underlying interaction mechanisms between ENM and biomembranes. It has been further discovered that while ENM's have the ability to become the newest regenerative medicine in the future, they also show harmful health effects. These adverse health effects can result in a wide variety of damages ranging from inflammatory effects to disease and so it is crucial to study ENM and to determine the extent to which they can aid in or prevent researchers and medical students from improving the life of an individual.

BIOMASS CONVERSION TO ETHANOL: RAPID BIOCONVERSION WITH INTEGRATED RECYCLE TECHNOLOGY (RaBIT)

Devin Schmitt
Home Institution: Milwaukee School of Engineering
Category: Chemical Engineering and Materials Science, Section 3
Poster: 121
Time: 3:15 PM - 5:00 PM
Mentor(s): Venkatesh Balan (Chemical Engineering & Material Science), Mingjie Jin (Chemical Engineering & Material Science)

Biofuel production from lignocellullosic biomass using the sugar platform presents many processing challenges. To produce an economic process, enzymatic hydrolysis and fermentation must provide means to recycle inputs such as enzymes and cells while condensing batch process times. Separate hydrolysis and fermentation (SHF) and simultaneous saccharafication and co-fermentation (SSCF) are the two processes most traditionally used. While SSCF combines enzymatic hydrolysis and fermentation in the same reaction vessel, SHF separates them to optimize reaction conditions for the enzymes and cells respectively. Rapid Bioconversion with Integrated recycle Technology (RaBIT) condenses the SHF process into two simultaneous 24 hour processes. Enzyme hydrolysis of pretreated biomass is conducted for 24 hours, after which the hydrolysate is removed for fermentation. The solids are returned to the next cycle of enzyme hydrolysis. This technique recycles valuable enzymes, digests more toilsome solids, and removes sugars that inhibit enzyme activity. In a parallel stream, fermentation is conducted on the hydrolysate for 24 hour cycles to produce ethanol at high cell loading. Genetically modified Y128 saccharomyces cerevisiae is used since it is engineered to consume xylose in addition to glucose. Similar to enzymatic hydrolysis, the yeast cells are reused to ferment the next cycle of hydrolysate. Enzymes continue to digest biomass during fermentation because a proportion of them are solubilized in the hydrolysate after enzymatic hydrolysis. The findings of this experiment will determine the amount of solids removal required for continuous RaBIT to be performed.

SOLAR CELLS BASED ON EARTH-ABUNDANT MINERALS

Juan Mena Lapaix
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 3
Poster: 122
Time: 3:15 PM - 5:00 PM
Mentor(s): Richard Lunt (Chemical Engineering & Material Science)

The use of photovoltaic cells to directly produce electrical energy from sunlight has been gaining attention as a possible solution for global energy needs. However, the cost-effectiveness of photovoltaics has limited the usage of solar energy. Most of the commercially available photovoltaic technologies use materials with high processing costs or materials of low abundance on Earth. The discovery of new inexpensive and earth abundant solar absorber materials may eliminate the limits posed by cost-effectiveness of photovoltaics. We report a solar cell based on naturally occurring mineral salts which shows

semiconductor characteristics suitable for energy purposes. Photophysical studies reveal an absorption band extending past 690 nm. We will discuss the performance of preliminary photovoltaic devices that show an initial power conversion efficiency of 0.0037% with current density (J_{sc}) of 0.0034 mA/mm^2, an open circuit voltage (V_{oc}) of 0.23 V, and little degradation when exposed to ambient conditions (oxygen and moisture). These earth abundant materials are promising candidates for low cost photovoltaics, warranting further investigation.

NEW NEAR-INFRARED ABSORBING DONOR MATERIALS FOR ORGANIC PHOTOVOLTAICS

John Suddard-Bangsund
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster: 123
Time: 3:15 PM - 5:00 PM
Mentor(s): Richard Lunt (Chemical Engineering & Material Science)

In the midst of a global rise in both energy demand and environmental concern, organic photovoltaics (OPVs) present a potentially low-cost means of clean energy production. As they are formed from abundant materials, feature relatively facile processing, and have excellent thin film properties, they have potential to be highly competitive with commercial solar cells. However, OPVs are currently limited, in part, by poor spectral overlap with the sun. The best cells to date absorb light only in the range of 300 – 800 nm, whereas silicon solar cells absorb to 1100 nm. Approximately half of incident solar power is thus left unutilized. In an effort to expand this range, this study explores several new solution-processable near-infrared (NIR) absorbing electron donor materials. Materials were measured for solubility in various solvents, spin-casted into uniform thin films, and characterized using UV-VIS spectroscopy. Photovoltaic devices were subsequently fabricated with the most promising candidates using a combination of spin-casting, thermal evaporation and sputtering. These devices were then characterized for current-voltage (JV) and external quantum efficiency (EQE). After optimization of the device architecture and processing methods, the efficiency is found to improve by an order of magnitude (up to 0.3%) with photocurrent generation demonstrated past 900 nm. With further processing improvement, these promising organic candidates could be used in transparent energy-scavenging applications, or could be incorporated into efficient panchromatic tandem cells.

NORMALIZING DATA TAKEN FROM DIFFERENT POPULATIONS

Nolan Reichkitzer
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster: 124
Time: 3:15 PM - 5:00 PM
Mentor(s): Timothy Whitehead (Chemical Engineering & Materials Science)

From recombinant DNA methods, creating large libraries of protein mutants is relatively simple. These mutants can then be assessed for function using a variety of selections or screens. Sequencing the resulting DNA allows us to positively identify these mutants. Interrogating protein libraries using such methods is important because we can rapidly optimize proteins for function, we can identify where therapeutic monoclonal antibodies bind, and we can investigate the relationship between the sequence of a protein and its function. The problem is that we can only read stretches of DNA on the order of 100 base pairs, and since genes that encode proteins are typically much larger we have to break protein libraries up into smaller libraries. This makes comparing multiple populations very difficult. In my work, we have derived an analytical solution for comparing different populations of protein mutants. Our analytical solution was then validated experimentally through fluorescently activated cell sorting and growth-based selection. This research will be extremely useful in fields of study that involve making large libraries of protein mutants.

NITROGEN AND CARBON PRECURSOR MODIFICATIONS FOR MNC CATALYST

Travis Hebden
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster: 125
Time: 3:15 PM - 5:00 PM
Mentor(s): Scott Calabrese Barton (Chemical Engineering & Material Science), Selvarani Ganesan (Chemical Engineering & Material Science)

With the rise of carbon dioxide emissions due to the burning of fossil fuels and worldwide need for energy, it is essential to research and develop new sources of clean energy. Polymer electrolyte fuel cells produce energy by electrochemically converting hydrogen and oxygen gas into water. This process is currently catalyzed by a precious metal catalyst. In order for fuel cells to be affordable for the average consumer, a non-precious metal catalyst with the same oxygen reduction efficiency as platinum-based catalysts must be created. As of now, the most productive non precious metal catalyst is a metal (transition, particularly 3d series)-Nitrogen-Carbon (MNC) catalyst. In order to optimize its performance, alternative nitrogen and carbon precursors must be explored. The effectiveness of the new precursors will be determined through both

electrochemical and physical characterization. Eventually, a combination of multiple high performing nitrogen and carbon precursors will be combined in one catalyst and tested for oxygen reduction reaction efficiency. Hence, the overall goal of this work is to enhance catalysis of oxygen reduction in MNC-catalyzed Polymer electrolyte fuel cells by altering the sources of nitrogen and carbon.

ROLE OF MULTIPLE METAL CENTERS IN ELECTROCATALYSIS OF OXYGEN REDUCTION IN FUEL CELLS

Philip Kim
Home Institution: City College of New York
Category: Chemical Engineering and Materials Science, Section 4
Poster: 126
Time: 3:15 PM - 5:00 PM
Mentor(s): Scott Calabrese Barton (Chemical Engineering), Selvarani Ganesan (Chemical Engineering)

As worldwide demand for energy grows and fossil fuel supply declines, the need for alternative sources of energy has become more apparent. The proton exchange membrane fuel cell (PEMFC) is a device that converts hydrogen to electrical energy through the reduction of oxygen within an electrolytic system. Though this fuel cell offers clean energy with little to no greenhouse byproducts, cost is one of the main limitations of the PEMFC. A method of reducing the cost of the PEMFC is to replace platinum-based catalysts used in the device with catalysts based on cheaper, non-precious transition metals. The purposes of this research are to synthesize various non-precious metal-based catalysts, including those based on iron, cobalt, and nickel, to compare catalysts' performances in oxygen reduction, and to perform morphological, spectroscopical and electrochemical characterizations of the synthesized catalysts.

FORMATION OF BUILDING BLOCKS FOR BIO-BASED POLYMERS

Allison Sutter
Home Institution: Michigan State University
Category: Chemical Engineering and Materials Science, Section 4
Poster: 127
Time: 3:15 PM - 5:00 PM
Mentor(s): Dennis Miller (Chemical Engineering)

The use of biomass as a feed stock for producing fuels and chemicals reduces our dependence on fossil fuels, reduces greenhouse gas emissions, and allows production of products that have better performance than their petroleum-based counterparts. In this project, we are examining the production of intermediate "building block" compounds to make bio-based polymers that are widely used as hard plastics and in consumer products such as paints and polishes. In our research, the intermediate is made from lactic acid (2-hydroxypropanoic acid), which in turn is made by fermentation of biomass carbohydrates. Our route involves the esterification of the 2-hydroxyl group of lactic acid with acetic acid to form 2-acetoxypropanoic acid (APA), and then esterification of APA to form the APA methyl ester. We are examining reaction conditions at which the APA methyl ester is formed most efficiently, without hydrolysis of APA or undesirable formation of methyl acetate.

CIVIL & ENVIRONMENTAL ENGINEERING

CREATING A WORLD CLASS COMMUNITY

Kimberly Dietzel & Katie Ling
Home Institution: Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster: 130
Time: 1:00 PM - 2:45 PM
Mentor(s): Patricia Crawford (Planning, Design & Construction), Scott Witter (Planning, Design & Construction)

Michigan State University is an internationally renowned institution positioned to play an active leadership role in the development of a World Class Community. MSU has harnessed its research capacity and intellectual resources by expressing the University's mission to serve the greater community in its initiative as an educational outreach and global institution. The "Bolder by Design" initiative calls for faculty and students to embrace this opportunity to serve the environment, community, and public within the surrounding environment. A primary focus of this academic and collaborative exercise is the development of an attractive, sustainable, and economically diverse "World Class Community" to complement the regional assets and anchor institutions of Lansing, Lansing Township, and East Lansing. The work by Team MSU-SPDC for this portion of the Corridor along Michigan Avenue and Grand River from US-127 to Bogue Street has been well received by many in the local community. The 34-person team grounded the project utilizing two decades of scholarly research within the Greater Lansing Area, based on Placemaking, along with case studies of entrepreneurial world class communities and Town-Gown communities around the world. The final product exemplifies Town-Gown principles through Placemaking practices of

connectivity (transportation), density (housing), and opportunity for employment (anchor institutions) that support a fundamental economy and the ability to attract and retain talent of the Twenty-First Century. These are expressed in over twenty sketches of how the "World Class Community" concept could look in the corridor.

IDENTIFICATION OF THE MICROORGANISMS PRESENT IN AN AEROBIC VINYL CHLORIDE OXIDIZING ENRICHMENT CULTURE

Alyse Way
Home Institution: Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster: 131
Time: 1:00 PM - 2:45 PM
Mentor(s): Alison Cupples (Civil & Environmental Engineering), Indumathy Jayamani (Civil & Environmental Engineering), Fernanda Paes (Civil & Environmental Engineering)

Vinyl chloride (VC) is a common toxin found in soils, surface water, groundwater and at times, drinking water. Classified as a human carcinogen, the US Environmental Protection Agency has set a Maximum Contamination Level of 0.002 mg/L and Public Health Goal of zero mg/L. Exposure to this chemical, by ingestion or inhalation, can result in an increased risk of cancer. The objective of the current study is to identify the microbial community present in an aerobic, VC oxidizing enrichment culture. The culture was enriched using groundwater obtained from a VC contaminated site in Carter, MA. The culture was amended with VC (100 mg/L) and almost complete oxidation was noted after 45 days. Extracted nucleic acids will be used to construct a 16S rRNA gene clone library using a TOPO TA cloning kit. The resulting sequences will be classified using the Ribosomal Database Project Classifier tool to determine which organisms are present in this culture. This work is important because bioremediation is a common remediation approach for VC contaminated aquifers and for this, it is important to know which microorganisms are involved in VC oxidation. The construction of this library will contribute on identifying known and potential novel organisms as aerobic VC biodegraders.

MINIATURIZED HANDHELD DEVICE USING IMAGE ANALYSIS FOR THE DETERMINATION OF CHEMICAL OXYGEN DEMAND

Kathleen Haynes
Home Institution: Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster: 132
Time: 1:00 PM - 2:45 PM
Mentor(s): Syed Hashsham (Civil & Environmental Engineering)

Quantitative assessment of natural organic detritus, and organic waste from waste water treatment plants, failing septic systems, agricultural and urban runoff, and streams and lakes are all measured as chemical oxygen demand (COD). The process used generates wastes consisting of potassium dichromate, mercury sulfate, and sulfuric acid. COD analysis with sample volumes of 240 µL, as opposed to the typical 2 mL, have been researched and are possible without compromising analytical accuracy. A portable COD device is in development which uses smaller amounts of chemicals, a smaller sample size, and is compact enough to be taken into the field and testing locations for use. Research is being done to determine how to miniaturize the process of COD, including the effect of smaller concentrations of chemicals and samples, how to easily and quickly distribute samples, how to analyze the samples once they were digested, and what type of material could handle temperatures used during digestion (up to 150◦C) and acidic substances. Determining how small a sample can be completely digested and accurately measured is the next step, along with determining if a color gradient curve is possible. A portable COD device would benefit engineers, scientists, and the environment by offering lower costs, less waste, and ease of use through its portability.

FRACTAL NATURE OF VISCOUS FINGERS FORMED DURING OIL-WATER SEPARATION

Claudio Calderon
Home Institution: University of New Orleans
Category: Civil and Environmental Engineering, Section 1
Poster: 133
Time: 1:00 PM - 2:45 PM
Mentor(s): Volodymyr Tarabara (Civil & Environmental Engineering)

The intrusion of a low density liquid into a higher density liquid produces formations called fingers. The fingers expand from the point of intrusion radially and form intricate patterns that under some conditions obey simple scaling laws. We are interested in the dynamics of finger formation and patterns produced during the injection of oil-in-water dispersion into an oil film. In order to study this process (also called viscous fingering), we designed a Hele-Shaw cell consisting of two glass plates separated by a very small gap; the top plate has a small orifice for injecting the "intruding" fluid (oil-in-water emulsion in our case) into the "defending" fluid (oil in our case). We will dye both oil and aqueous phases to visualize and more accurately quantify the structure of the boundary between them. We will use image processing software and simple

numerical algorithms to determine whether the fingers have fractal structure and, if yes, what their fractal dimension is for different injection rates. We expect the study to provide insights into the behavior of oil during filtration of oil-water dispersions such as those that form during fracking operations and oil spills.

FACTOR V LEIDEN DETECTION BY ISOTHERMAL AND PCR BASED ASSAYS IN A POINT OF CARE DEVICE

Michael Stevens
Home Institution: Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster: 134
Time: 1:00 PM - 2:45 PM
Mentor(s): Syed Hashsham (Civil & Environmental Engineering)

Deep venous thrombosis has been linked to the single-base mutation of the Factor V (F5) gene, known as Factor V Leiden. Factor V Leiden stops proteins from deactivating the clotting process. Current methods for genotyping of Factor V Leiden require sample and product processing. An in home Point of Care (POC) device would eliminate the need of a laboratory and hours spent on sample preparation. Many assays exist to genotype mutations but are not available for in home risk assessment of genetic disease or self diagnosis purposes. Isothermal and PCR methods are being developed for the detection of Factor V Leiden. Primers target the F5 gene at the G1691A mutation site. Primer Express 2.0 (Applied Biosystems) software was used to design primers for a PCR Assay and Primer Explorer v4 (Eiken Chemical) was used to design primers for a LAMP Assay. A basic PCR method using two forward primers, a mutant type and a wild type, and one reverse primer will be designed. Many different polymerases and blood concentrations will be tested to find what polymerase can handle the highest concentration of blood in the reaction. Other types of less invasive samples, urine or saliva, will be acquired and similar tests will be conducted. An in home POC device that is capable of genotyping is a cost effective and quick way to determine risk for genetic disease.

HIGH FLUX FILTER DESIGN FOR DIRECT CELL AMPLIFICATION WITHOUT RECOVERY LOSSES

Samantha Eanes
Home Institution: Michigan State University
Category: Civil and Environmental Engineering, Section 1
Poster: 135
Time: 1:00 PM - 2:45 PM
Mentor(s): Syed Hashsham (Civil & Environmental Engineering)

Sample concentration is crucial for drinking water microbial quality assessment. Membrane filtration is commonly used to filter larger volumes of water and concentrate cells on a filter. An ideal filtration system would maximize flux and cell recovery. After sample concentration by filtration, recovery of cells for molecular assays is not quantitative and results in poor efficiency of recovery. Improved cell recovery would result in more accurate microbial water quality assessments. The development of a filter designed to fit into a polymerase chain reaction (PCR) tube for direct cell amplification serves multiple purposes. It prevents a loss of cells by transferring the entire filter into the PCR tube and also eliminates many of the sample recovery processes between filtration and direct amplification. The filter design involved a microfiltration membrane filter secured to a luer lock attachment on a 20 mL syringe via a truncated pipette tip. Flux was tested by forcing water out of the syringe by hand-pressure, which is estimated at 5-10 psi. In tests using distilled and tap water the membrane returned a flux of approximately 330 mL/min/cm^2. Cell recovery and filter interference were tested using loop mediated isothermal amplification (LAMP) methods and *E. coli* K12 dilutions. Results suggest possible optical interference from the presence of the microfiltration membrane in the LAMP reaction. Additional research may determine a high flux filter media that does not cause optical interference in direct amplification.

EFFECT OF SIZE, ORIENTATION, AND ANCHORING MECHANISM ON STRAIN MEASUREMENTS FROM PIEZOELECTRIC STRIPS

Moses Pacheco
Home Institution: University of Nebraska-Lincoln
Category: Civil and Environmental Engineering, Section 1
Poster: 136
Time: 1:00 PM - 2:45 PM
Mentor(s): Karim Chatti (Civil & Environmental Engineering), Nizar Lajnef (Civil & Environmental Engineering)

According to the American Society of Civil Engineers, poor roads are costing U.S. motorists over $67 billion each year. In addition, crashes due to roadway conditions are costing the U.S. economy $230 billion per year as well as lost lives. Technology exists to develop a smart sensing system for pavement monitoring that can reduce maintenance and rehabilitation expenditures. This project is part of a two phase proposal to advance wireless self-powered sensing in pavements and place sensors in the pavement on-site without disrupting the construction process. The research presented herein aims to implement a smaller sensor and to evaluate the attaching efficacy and bonding properties of a pavement monitoring system. One-inch long piezoelectric strips will be cast in epoxy and set inside the bottom center of an 18 in. x 4 in.

x 4 in. concrete beam. Three strips will be placed inside each beam in a 60° strain rosette layout with the y-axis running longitudinally across the center of the beam. Concrete beams will be tested in three point bending with the piezoelectric strips measuring strain at the bottom fiber of the beam. Strain measurements by the piezoelectric strips will be validated by finite element analysis and COD strain gage readings. Comparison of strain data from nine beams will determine if small piezoelectric strain sensors can measure strain as accurately as strain gages. Three different anchoring systems for the piezoelectric strip will be tested for attachment and bonding to the host material.

COMPUTER SCIENCE & ENGINEERING

IMPROVING THE EFFICIENCY OF IMAGE INFORMATICS

Cecilia Prentice
Home Institution: Clemson University
Category: Computer Science and Engineering, Section 1
Poster: 140
Time: 1:00 PM - 2:45 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Image segmentation and anchor point analysis are two very useful aspects of image phenomics that can be used by scientists to gather important data about the subjects of an experiment or study. Segmentation and anchor points can provide very valuable data about how animals move, how many organisms are in a particular image, the size or length of a subject, growth patterns of organisms, and many other valuable pieces of information about a subject. However, using these tools is a very time consuming process for users. Users must gather their data and segment or make anchor points on each image individually, which could take several weeks depending on the size of the data set. This is a problem because it wastes the valuable time of researchers that could be better spent on other aspects of their research. When completed, Chamview (anchor point detection) software will save researchers weeks of time by using a learning algorithm in its anchor point software that will allow the program to “learn” what points the user is looking for. After pinpointing anchor points in images Chamview will learn what points on an image a user is interested in and will automatically detect similar points in future images, allowing the user to save substantial amounts of time. Our semi-automatic image segmentation tool will perform a similar role as the Chamview software; however, instead of predicting anchor points it will predict the portion of an image (“foreground”) that the user wishes to be segmented from the background.

AVIDA CHECKPOINT/RESTART IMPLEMENTATION

Nilab Mohammad Mousa
Home Institution: Boise State University
Category: Computer Science and Engineering, Section 1
Poster: 141
Time: 1:00 PM - 2:45 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Avida software is a platform to study self-replicating and evolving digital organisms. It can simulate several artificial life generations given continuous computational time. The number of generations and the time it takes to propagate organisms for several hundred generations is limited by the processing power available. At Michigan State University, the High Performance Computer Cluster (HPCC) only provides at most one week of continuous computational power for a computational job running on the cluster. If an experiment requires a time frame of more than one week, HPCC will not be able to provide the resources necessary. Due to the complexity of the software, researchers are unable to save the current running state of the application and resume the execution later on the same or a different machine. This resumption ability of software is called checkpoint/restart. In this research, we examine whether or not Berkeley Lab Checkpoint/Restart (BLCR) can be integrated with the run script that is used for Avida. Adding checkpoint/restart functionality to Avida will have multiple impacts to the research: long running jobs (weeks or months) will be able to run on time restricted computing systems (hours or days); long running jobs will also become more robust to system failures; and interesting new research can be conducted without having to restart all jobs from the beginning.

RESEARCH CENTERED DESIGN: A CASE STUDY IN BUILDING USABLE IMAGE ANALYSIS TOOLS FOR RESEARCHERS

Aaron Beckett
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 1
Poster: 142
Time: 1:00 PM - 2:45 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Drawing on experience gained through a previous software survey of video annotation programs, this project proposes four aspects of these programs as key measures of quality. First is the program's set of features, which is essentially all tasks it

can perform. Next is the program's customizability or the degree to which these tasks can be modified by the user. Third is work flow, or the ease of use of the program's features. And lastly is accessibility, which is the ability of a user to learn how to use the program. This poster discusses the graphic user interface of Chamview, an image analysis tool that was made to increase the efficiency of anchor point selection in images. The Chamview GUI was designed with the above parameters in mind and through its analysis this project hopes to identify future developments for the Chamview GUI and demonstrate a design mindset that balances a program's feature set, customizability, work flow, and accessibility.

INTERPOLATION OF IDENTIFIER POINTS OF LANDMARKS THAT CREATE STITCHED IMAGES WITH VARYING LEVELS OF FOCUS

Sean Heider
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 1
Poster: 143
Time: 1:00 PM - 2:45 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Use of identifier points in two coplanar images along with the image-stitching algorithm will interpolate the focal point of the combined image. This result will be an accurate representation of different depths of focus. The main goal of this project is to use two sets of identifier points and create several hundred images to show the transition of the focal point between landmarks and observe how other objects in the image will come in and out of focus. Several key images have been created and have confirmed the image-stitching algorithms correctness. What will be tested is how the focal point will adjust between these four sets of identifier points as we start from one landmark and end on another.

THREATS ASSOCIATED WITH VEHICULAR AD HOC NETWORKS (VANETS)

Lars Kivari & Mathias Masasabi
Home Institution: Oakland University
Category: Computer Science and Engineering, Section 1
Poster: 144
Time: 1:00 PM - 2:45 PM
Mentor(s): George Corser (Oakland University: Computer Science & Engineering)

Vehicular Ad Hoc Networks (VANETs) are the pinnacle of 21st Century technology. While vehicular communication via this network offers a variety of positive services, it may be susceptible to malicious attacks and threats. Due to the complexity of this system, it is a high target for cyber terrorism and hacking. To better understand these attacks, we will present threats posed to VANETs. These threats will include vehicle tracking, manipulation of GPS coordinates, impersonation of law enforcement safety devices, and petty crime such as robbery or theft. In addition, we will discuss research and statistics pertaining to General Motors OnStar and the Federal Bureau of Investigation's (FBI) Stingray Phone Interceptor. These two systems have helped with the development of possible VANET threats because both systems have been manipulated by various personnel resulting in the intrusion of privacy. By exploring OnStar and the Stingray, a clearer roadmap of the possibilities of attacks will be presented. We will conclude by summarizing possible defense methods that OnStar and the Stingray provide for VANETs.

CLASSIFICATION OF AVAILABLE VANET TRUST MODELS AND A PROPOSED MESSAGE-BASED APPROACH

Neha Gupta & Greg Johnson
Home Institution: Michigan State University, College of Idaho
Category: Computer Science and Engineering, Section 1
Poster: 145
Time: 1:00 PM - 2:45 PM
Mentor(s): Huirong Fu (Oakland University: Computer Science & Engineering), Jared Oluoch (Oakland University: Computer Science & Engineering)

Upcoming technology develops VANETs (vehicular ad-hoc networks), to be used for wireless communication between vehicles to allow road-users to gain insight into road conditions, hazards, and entertainment. When receiving information on an event, a conflict of interest is deciding what incoming messages to trust or not trust, as a typical VANET unit in one vehicle may receive conflicting messages. Several studies have proposed models about trust-forming methods and reputation-schemes. We categorize these authors' models using two different methods. Then, we propose our own message based approach and categorize it according to existing models. Our model divides experience-based trusts, a stored value for a node based on reputation, into five different categories. This ensures that the selected experience-based trust is useful for the event and will aid with the detection of malicious nodes, which are vehicles reporting falsely to deceive the message-receiver.

MODIFIED SELF ORGANIZING FEATURE MAPS FOR CLASSIFICATION OF MATHEMATICAL CURVES
Daniel Liu & Lionel Puengue
Home Institution: University of Michigan, Wayne State University
Category: Computer Science and Engineering, Section 2
Poster: 146
Time: 3:15 PM - 5:00 PM
Mentor(s): Mohamed Zohdy (Oakland University: Electrical & Computer Engineering)

In this paper, we applied Self Organizing Feature Maps (SOFM) to the categorization of mathematical objects in the form of families of curves. We have considered three different categories of curves: functions, relations and elliptic curves used for cryptography. The features have been extracted from independent variable -domain, frequency-domain as well as joint independent variable-frequency space obtained by transformations on the curves. Testing of the learned curves and their classes has been done following the training and system convergence. New contributions have been attempted, such as features from joint independent variable-frequency space, applying multiple similarity norms, history keeping functions, more effective initializations namely k means last but not least input sequencing. Although this study is significant, extensions to other space objects such as surfaces and spheres will be considered and later on several applications of the SOFM will evolve namely in the financial sector and in the chemical field as well as physical applications.

APPLICATIONS OF THE FIREFLY ALGORITHM
Vishaal Kalwani & Anna Rode
Home Institution: University of Michigan
Category: Computer Science and Engineering, Section 2
Poster: 147
Time: 3:15 PM - 5:00 PM
Mentor(s): Mohamed Zohdy (Oakland University: Electrical & Computer Engineering)

Bio-inspired algorithms are a class of algorithms that translate complex behaviors from nature, such as the movement of ants, into code and then modify them to solve computational problems. One in particular, the Firefly algorithm, mimics the flashing of fireflies for sexual selection, and then solves optimization problems by representing solutions as mobile fireflies. In this project, a new version of the firefly algorithm will be developed by examining the limiting assumptions on the existing version. For example, all fireflies are currently considered unisexual, which could be changed to male and female variants. To optimize the algorithm, extensive coding and testing using Matlab will be performed to determine and quantify performance issues as well as areas of improvement. Applications of the improved algorithm include evolving areas such as Cyber Physical systems, particularly the robotic Dragonfly aerial vehicle.

TOOLBOX FOR EVALUATING ALGORITHMS THAT DETECT ANCHOR POINTS IN IMAGES
Manuel Dosal
Home Institution: The University of Texas at El Paso
Category: Computer Science and Engineering, Section 2
Poster: 148
Time: 3:15 PM - 5:00 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Chamview is a software that helps researchers to annotate anchor points in their research data. Anchor points are used in all types of image analysis workflows to measure and quantify information contained in research data. There exists no single anchor point detection algorithm that can detect points for general research problems. Therefore, the default and traditional analysis approach is to hiring students to manually annotate the images, which is an extremely slow process. Chamview is being developed in response to the challenge of analyzing and annotating large image datasets. Several predictors have been developed in order to make the research workflow faster using Chamview. These predictor algorithms utilize machine learning techniques to find anchor points automatically. In this project, methods have been developed to measure the accuracy, computational timing and error of these predictors, which have been tested using a wide variety of representative research datasets. Results obtained are essential to provide guidelines in improving these predictors.

TRUST MANAGEMENT IN VEHICULAR AD-HOC NETWORKS (VANET)
Stephen Jarnagin
Home Institution: Southern Illinois University at Edwardsville
Category: Computer Science and Engineering, Section 2
Poster: 149
Time: 3:15 PM - 5:00 PM
Mentor(s): Huirong Fu (Oakland University: Computer Science & Engineering)

Vehicular ad-hoc networks (VANETs) is a variation of MANET developed for vehicles. When these vehicles come within a certain range of each other, these vehicles communicate with each other about various topics related to the conditions of the

road. The purpose of these messages is to assist the driver in determining the most efficient and safest course of action to take. The agents whom communicate these messages are also given distinct markers to better determine the value of the messages they send. The focus of this experiment is to determine the validity of the agents, the accuracy of the messages, and how these entities behave in their environment.

TEXTURE ANALYSIS OF MRI IMAGES FOR PROSTATE TUMOR DETECTION

Ro Jie Li, Danielle Boileau, & Daniela Martignani
Home Institution: Case Western Reserve University, Michigan State University, Oakland University
Category: Computer Science and Engineering, Section 2
Poster: 150
Time: 3:15 PM - 5:00 PM
Mentor(s): Jia Li (Oakland University: Computer Science), Neelam Tyagi (Beaumont Hospital: Oncology)

Textural features have been known to uniquely identify and recognize similar pixel regions in any digital image. In this project, we have made use of ten textural and statistical features to automatically detect and identify tumor regions within an MRI image. Our preliminary analysis showed that mean, standard deviation, and entropy to be the most powerful features in identifying tumor locations because they showed ranges more specific to the tumor region. On the other hand, energy, contrast, correlation, and homogeneity were not useful features. Correlation had too many undefined values to be used, and the other three did not show any significant difference between areas in the image. The features were then used in a Gaussian-based classifier to separate tumor regions from healthy prostate regions. The classification method detected all of the tumor points; however, some areas in the MRI had similar feature values to the tumor, causing many non tumor points to be identified as tumor, as well.

IMPLEMENTING A VIRTUAL COMPUTER LAB

Braden Leinbach
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 2
Poster: 151
Time: 3:15 PM - 5:00 PM
Mentor(s): Andrew Keen (Institute for Cyber-Enabled Research), Ben Ong (Institute for Cyber-Enabled Research)

Working with an open source project, VCL, to implement a dynamically reconfigurable software environment to support research and research education. VCL will provide researchers the ability to procure customized, reproducible Windows and Linux environments. This project leverages virtualization, scheduling, and resource management, and examines integrating VCL resources into MSU's IT environment.

DEFINING A MAPPING BETWEEN A ROBOT'S CURRENT STATE AND ITS FUTURE STATE

Cody Littley
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 3
Poster: 152
Time: 3:15 PM - 5:00 PM
Mentor(s): Joyce Chai (Computer Science)

In order for a machine to perform useful tasks, it must from time to time make decisions based on the information available to it, or its state. The state of a machine may contain many discrete elements, such as servo positions, visual data, and speech recognition results. My team has been working on a robust system that allows a developer to define a mapping between a robot's current state to its future states. In many ways, this system is similar to a finite state machine. In fact, any behavior created with our system may be reproduced with a sufficiently elaborate finite state machine. Our mapping, however, is a many to one function, meaning that it possible for the machine to react to a large number of possible internal states with only a small number of instructions. Each instruction, or rule, has a level of generality. The more specific a rule, the higher priority it is given. This allows for specific subroutines and general rules to co-exist even if there is overlap. Using this system, we have been able to produce seemingly complex robot behavior, including limited verbal interaction with humans, with fewer than twenty instructions for mapping certain internal states into other states.

EFFECTS OF VOLTAGE ON NANOTUBES AND NANOSHELLS

Nathan Gray
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 3
Poster: 153
Time: 3:15 PM - 5:00 PM
Mentor(s): Lixin Dong (Electrical & Computer Engineering)

Mulitwalled carbon nanotubes (MWNTs) are heavily affected by the Van der Walls and electrostatic forces. Applying a charge to either side of the nanotube will cause the individual shells to shift, allowing for manipulations of the nanotube shape. By analyzing the intermolecular forces between carbon molecules, one can derive an equation for the amount of movement between shells. Further comparing results from the equation to experimental data confirms the equation's functionality. The equation computes the movement of the nanotube based on the outer shell's lengths, the inner shell's lengths, the number of outer shells, the number of inner shells, the voltage, initial length of extrusion from the core shell to the outer shells, and the mass of the atom. This equation will allow researchers the ability to quickly compute and compile data. With this equation we hope to see a rapid expansion of MWNT findings.

MOBILITY MODELS' EFFECTS ON VANET SIMULATIONS

Patrick Derrico & Warren Ma
Home Institution: College of New Jersey, Emory University
Category: Computer Science and Engineering, Section 3
Poster: 154
Time: 3:15 PM - 5:00 PM
Mentor(s): George Corser (Oakland University: Computer Science & Engineering), Huirong Fu (Oakland University: Computer Science & Engineering)

A Vehicular Ad hoc Network (VANET) is a proposed method to enable vehicle to vehicle communication as it is needed. The benefits of such a system include, but are not limited to, allowing additional safety through vehicles communicating their routes and access to information about potential destinations while driving. One of the major concerns that still remains before the eventual widespread implementation of VANET systems is the privacy of users' sensitive information while driving. Since users need to transmit their identity and location to many vehicles and infrastructural units, an attacker could intercept this information and use it to steal the user's identity or commit other types of crimes. For this reason, privacy models are being developed to provide solutions to the privacy problems that may occur. What these models often fail to consider is the effect on the road topology on the privacy provided to the vehicles, as the density and distance between cars may influence the effectiveness of these communications. Mobility models, which model the behaviors of nodes on a map, are worthy of consideration when taking these issues into account. Therefore, an investigation on the the potential effects of various mobility models on VANET systems and their privacy may prove to be essential in solving the current privacy challenges. Our goal is to present an analysis of the implications of using different mobility models when simulating VANETs.

AUTOMATED IMAGE SEGMENTATION SYSTEM FOR USE IN RESEARCH WORKFLOWS

Ali Radha
Home Institution: University of Michigan
Category: Computer Science and Engineering, Section 3
Poster: 155
Time: 3:15 PM - 5:00 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Image segmentation is a common tool used in image data analysis; objects of interest often need to be identified and separated from the rest of an image. Automatic image segmentation is difficult because objects of interest vary between research projects, yet there exists no segmentation algorithm that can produce a satisfactory segmentation for all problems. We are developing software that will find the optimal segmentation algorithm for a given dataset by using a machine-learning algorithm. The software includes a variety of interchangeable segmentation algorithms that the learning algorithm searches from, finding an algorithm best suited for a particular research project. This study contains the baseline research done in developing this automated segmentation system.

THE DIFFERENTIAL EXPRESSION BETWEEN MOLGULA OCCULTA AND MOLGULA OCULATA

Ian Mahone
Home Institution: Michigan State University
Category: Computer Science and Engineering, Section 3
Poster: 156
Time: 3:15 PM - 5:00 PM
Mentor(s): Elijah Lowe (Computer Science and Engineering)

Molgula occulta and Molgula oculata are translucent tunicates with two protruding siphons that are generally found attached to either slow moving objects or organisms. Not to mention, they are also found on sandy shore bottoms, rock, docks, etc. Even though these two organisms share a lot in common, they have a key difference. That difference being that during the early developmental stages M. oculata has a tail, while M. occulta does not. Which leads me into my project of why one species has a tail and the other species does not. By quality trimming raw reads and running them through digital normalization pipeline, we will have a reduced data set with less error but essentially the same amount of information. These reads can then be de novo assembled in the cloud computing system using programs such as Velvet/Oases. From there we will have a transcriptome for each species. Once the transcriptomes are assembled, we can then annotate them using a more

studied tunicate, Ciona intestinalis. With annotated transcriptomes we can then identify the absence or presence of the genes using blast. Furthermore, by taking those annotated transcriptomes we would generate expression counts by using programs like Bowtie, Tophat, and HT seq. With the use of the count data we will conduct differential expression analysis between the two species, using the statistical programming platform R to show the genetic difference between these two species, which will help us derive why one is tailed and why the other is not.

ELECTRICAL & COMPUTER ENGINEERING

STRUCTURAL HEALTH MONITORING OF DISSIMILAR MATERIAL LAP-JOINTS USING TIME-REVERSAL OF ULTRASONIC GUIDED WAVES

Sahithya Chodimella
Home Institution: Georgia Institute of Technology
Category: Electrical and Computer Engineering, Section 1
Poster: 161
Time: 1:00 PM - 2:45 PM
Mentor(s): Mahmood Haq (Mechanical Engineering), Oleksii Karpenko (Electrical & Computer Engineering), Lalita Udpa (Electrical & Computer Engineering)

The use of adhesively bonded joints has recently gained a lot of attention in automotive, marine, and aerospace applications. Nevertheless, a major hurdle limiting the full acceptance of such structural components is the lack of in-situ monitoring techniques to evaluate their strength, which largely depends on the integrity of the bonding layer. In this work, guided wave inspection with externally mounted piezoelectric (PZT) sensors is employed along with Time-Reversal for Structural Health Monitoring of dissimilar material lap-joints. Specimens made from aluminum and glass-fiber composite adherends, were manufactured with and without defects in the bonded region. Damage was deliberately created by removing a segment of adhesive tape between the plates before curing. Optimal sensor geometry, actuation frequency and guided wave mode were selected by analyzing dispersion relations of the structure in order to maximize sensitivity to delaminations. The simulated defect was detected by comparing forward and time-reversed signals corresponding to damaged and healthy wave paths. Data fusion from multiple sensor pairs provided imaging to determine the location of damage. The results of inspection were further validated with ultrasonic C-scan. Overall, the technique has proven itself useful for early delamination detection at critical bonded joints and it shows promise to determine residual strength of such components. Keywords: Dissimilar material lap-joints, SHM, guided waves, time reversal, delamination.

THE NUMEROUS APPLICATIONS OF GRAPHENE

Curtis Williams
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 1
Poster: 162
Time: 1:00 PM - 2:45 PM
Mentor(s): Wen Li (Electrical & Computer Engineering)

Over the summer, I have done research in the field of micro-technology. My main subject of research is graphene. Recent research has gone into the depths of graphene. Graphene is a flat monolayer of carbon atoms tightly packed in a two-dimensional honeycomb lattice. Because of its ballistic transport at room temperature it is huge in the study of material science and condensed matter-physics. Graphene is the basic building block of graphite and is said to have more properties than the common silicon-based technology use today. Chemical vapor deposition (CVD) of graphene on a Cu foil is a common approach to synthesize graphene material with large dimensions. Using Cu/graphene/PMMA foil and a common FeCl3 etchant/ CuCl2 etching solution, the graphene thin film can be transferred from the Cu foil onto any substrate (e.g., silicon, polymer, and glass) for subsequent micro-fabrication. The procedure involves placing the foil in the solution and letting the material dilute for several hours, after which the material was placed on a Parylene C coated silicon chip for the next step of the procedure. A material containing folds and wrinkles poses a major limitation to the range of substrates. My STEM Outreach project involves the use of LED's and soldering techniques. The project involved high school students creating PCBs for luminescent Frisbee using LED lights and handmade PCB kits. Not only did the project introduce PCB components such as capacitors, resistors, and MCUs, but it also gave them basic soldering experience.

MODULAR RODENT TRAINING FACILITY FOR EXTRAOPERATIVE OPTOGENETIC STIMULATION AND μECOG NEURAL RECORDING CONTROLLED USING A FPGA

Brenton Sirowatka
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 1
Poster: 163
Time: 1:00 PM - 2:45 PM
Mentor(s): Ki Yong Kwon (Electrical Engineering), Wen Li (Electrical Engineering)

The training facility I designed and built required that it be modular to facilitate adding devices to be used in training a rodent. By using a FPGA, any training device can be monitored and controlled as well as be used to stimulate the rodent by powering LEDs and record the brain's electrical activity through electrodes. We are currently testing an open-source electrophysiology tool to accomplish this. The training facility was adapted to track the rodent's paw using a video camera by making the cage high up. To increase rodent activity during the daytime, infrared lights were installed to allow video recording. A luminescent Frisbee project was also created for high school students interested in engineering which was powered using simple electrical components and a microcontroller.

IMPLEMENTING A PHOTOVOLTAIC SYSTEM ON AN GLIDING ROBOTIC FISH

Scott O'Connor
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 1
Poster: 164
Time: 1:00 PM - 2:45 PM
Mentor(s): Xiaobo Tan (Electrical & Computer Engineering)

Gliding robotic fish provide a great platform for underwater sensing applications and aquatic research. One of the limitations for gliding robotic fish is battery life. A proposed solution to extend battery life is through a photovoltaic system mounted on the body of the vehicle. The solar array is made from custom encapsulated silicon solar cells mounted to the wing of the glider. A boost maximum power point tracker (MPPT) is used to improve the efficiency of the array. On a sunny day near the surface, it is estimated that the system can provide up to 20 watts of power. Using a solar array and MPPT can prolong deployment life of the fish, allowing more remote locations to be monitored.

ELECTRICAL CONTACT RESISTANCE MEASUREMENTS FOR THERMOELECTRIC MATERIALS USING EXTRAPOLATION METHOD

Matthew Luzenski
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 1
Poster: 165
Time: 1:00 PM - 2:45 PM
Mentor(s): Tim Hogan (Electrical & Computer Engineering)

A voltage measurement system was designed using an XYZ stage, stepper motors, Keithley meters and LabView programming environment. Voltage measurements were taken at room temperature on thermoelectric materials. To avoid voltage offsets due to temperature gradients the electrical current was flipped from positive to negative values during the measurement. An XYZ stage with stepper motors was used to translate a voltage probe with connections to a Keithley 2400 Source Measure Unit and 2182 Nanovoltmeter. Data acquisition and control were developed using LabView virtual instruments to run both 1D and 2D scans of the voltage profile across a sample with a step resolution of 50 μm. Saved data from scans was used to calculate electrical resistivity of the thermoelectric material and to determine contact resistance at the electrodes by monitoring the voltage jump at the electrode to sample interface.

METAMATERIAL-INSPIRED MICROWAVE GLUCOMETER FOR NON-INVASIVE MEASUREMENTS

Jennifer Byford
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 2
Poster: 166
Time: 3:15 PM - 5:00 PM
Mentor(s): Prem Chahal (Electrical Engineering), Kyoung Park (Electrical Engineering)

Monitoring blood glucose is essential to minimize the adverse side effects of diabetes. Currently there is no FDA approved noninvasive glucometer on the US market. Some of the most promising technologies are near-infrared (NIR) spectroscopy, optical rotation of polarized light and skin fluid extraction. NIR technology requires frequent calibration and is difficult to use as glucose is responsible for <0.1% of NIR absorbed in the body. Methods using optical rotation of polarized light, as well as skin fluid extraction, measure glucose at the skin level and not the blood directly creating a lag between the glucose measured and when it was actually in the blood stream. We propose using a microwave structure, a 6.5GHz metamaterial-inspired microstrip periodic bandstop filter, to detect blood glucose concentration though its direct correlation to the dielectric constant of blood. This approach has many advantages given the ease of microstrip fabrication, ability to miniaturize the structure with use of metamaterials and avoiding redundant re-calibration. Working similar to a thumb reader, the proposed sensor will interrogate bio-fluids within the fingertip and could ideally be used in a noninvasive continuous glucose monitoring system. For the demonstration, the sensor is co-integrated with microfluidic channels that mimic arteries. Our structure and microfluidic channel were designed and simulated using a finite element design tool, the structure was fabricated using wet-etching techniques and the channel using a PDMS mold. The assembled unit is

characterized using a Vector Network Analyzer to detect phase, modulus (Q-factor) and resonant frequency shift with varying glucose concentrations.

A BEHAVIORAL SETUP FOR OPERANTLY CONDITIONING RATS IN SENSORIMOTOR TASKS

Hannah Batchelor
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 2
Poster: 167
Time: 3:15 PM - 5:00 PM
Mentor(s): Karim Oweiss (Electrical & Computer Engineering)

Studying sensorimotor integration involves precise control over sensory inputs to guide motor actions. In rats, the whisker system is ideal for studying these mechanisms due to its precise somatotopic organization; each whisker is associated with a distinct inter cortical column and its utility in the active exploration of the surroundings. Much remains unknown in this system about how sensory inputs give rise to distinct motor outputs. In this study we aim to design a behavioral setup to train the animal on perceiving different types of tactile inputs and reporting their perceptual experience through distinct motor targets. Through the use of a modular nose-poke reporting system, animals will be cued with multiple tactile inputs to their whiskers while fixating in a center nose poke hole. They then will be required to report their perception of these inputs by poking into one of the peripheral target holes. We expect that the animals will be able to discriminate between these different inputs to guide their perceptual reports. Our next goal will be to engineer surrogate patterns of stimulation to instruct the animal to perform a similar task without the presence of the physical stimuli. Our findings may pave the way towards providing lost somatosensory feedback to patients with sensorimotor impairments.

MICRODRIVE ARRAY FOR SIMULTANEOUS ABIOTIC NEUROMODULATION AND RECORDING OF NEURAL ACTIVITY

Samuel Akwei-Sekyere
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 2
Poster: 168
Time: 3:15 PM - 5:00 PM
Mentor(s): Julian Alford (Electrical & Computer Engineering), Ali Mohebi (Electrical & Computer Engineering), Karim Oweiss (Electrical & Computer Engineering)

The elucidation of vertebrate brain function has been challenging due to its complexity. In vitro studies of brain slices and neuronal cultures have been widely used to comprehend the mechanisms of brain function at the cellular level. However, the complex neural networks that manifest emergent structures prove to be challenging to unravel, with in vitro techniques. The in vivo observation of neuronal activity in neural ensembles via chronically implanted electrodes, principally in the brain of primates and rodents, has been integral to the study of the underlying mechanisms involved in brain function and the cognition of how neural networks integrate information to yield specific behaviors. To this end, a microdrive array designed for simultaneous in vivo abiotic neuromodulation and recording of neural activity was developed. The microdrive array was designed to modulate neural activity via electrical stimulation of neurons or optical stimulation of genetically-sensitized neurons. Electrical stimulation parameters outside a specific range may damage the electrodes through which the current is injected into the brain tissue, due to faradaic reactions and/or capacitive reactions that occur at the point of contact with the brain tissue. To reduce the impedance-increasing effect of these reactions, low impedance tetrodes with safe reversible charge injection limit for simultaneous recording and electrical stimulation were used. The next step is to simultaneously record and modulate neural activity in a rodent's brain after surgical implantation. The device will be useful in the study of neural activity for the design of prostheses and treatment of neurological disorders.

EMBEDDED VISION BASED AERIAL MANEUVERING FOR A MINIATURE JUMPING ROBOT

Chenli Yuan
Home Institution: Michigan State University
Category: Electrical and Computer Engineering, Section 2
Poster: 169
Time: 3:15 PM - 5:00 PM
Mentor(s): Jianguo Zhao (Electrical & Computer Engineering)

This project aims to study the vision based control for a miniature jumping robot. Specifically, we will use vision feedback from a miniature camera to control the mid-air orientation of a miniature jumping robot. With two consecutive images obtained from the camera, we can estimate the robot's motion using an image interpolation algorithm. In this way, we can compute a control command to regulate the robot's body angle to a desired value by actuating a rigid tail connected to the body. We design and test the embedded vision based control system. The system is integrated to a previous designed tail assisted miniature jumping robot. Experiments are conducted to verify the proposed control scheme. The study in this project will validate the vision based control widely found in small insects such as bees. Moreover, the robot with vision feedback has a wide range of application such as search and rescue, environmental monitoring, and biological motion analysis.

DEVELOPING A WIRELESS MIND-CONTROLLED ROBOT USING A NON-INVASIVE SINGLE-ELECTRODE EEG SENSOR
Maria Castano
Home Institution: Florida International Universtiy
Category: Electrical and Computer Engineering, Section 2
Poster: 170
Time: 3:15 PM - 5:00 PM
Mentor(s): Dean Aslam (Electrical & Computer Engineering)

The development of mind-controlled robots is a research area that utilizes brainwaves produced by neurons as a result of mental activity. This particular area dealing with robots is of growing interest because of its application in Robotic-Human interfaces, an important area dealing with development of advance prosthetics. As a result, the need for simple, compact and affordable mind-controlled systems, as well as the need for a wireless link from the robot to the person is growing. In the last 2 years the neural engineering research group at Michigan State University has produced mind-controlled prosthetics and robots using a wired connection between the EEG (Electroencephalograph) sensor and the robot. The objective of my research is to develop a wireless mind-controlled robot using a single non-invasive homemade electrode. My task is to overcome the challenges involving wireless connection, as well as try to maintain the robot and the wireless system as compact, efficient, and simple as possible. The research involves two control modules; each containing an MSP430 micro-controller, a transceiver and a battery. The head-mounted module will process the brainwave data collected by the EEG electrode, which in placed in the person's forehead, using a commercially available NeuroSky chip, and wirelessly transmit it to the second module mounted on a LEGO robot, which will in turn move depending on the person's concentration level. The successful implementation of this wireless mind controlled robot will advance the current research in the neural engineering research group at MSU, and expand opportunities the field of prosthetics.

ENVIRONMENTAL SCIENCE & NATURAL RESOURCES

OPTIMIZATION OF A FLOW ELECTROLYER
Andrew Henika
Home Institution: Michigan State University
Category: Environmental Science and Natural Resources, Section 1
Poster: 175
Time: 1:00 PM - 2:45 PM
Mentor(s): James Jackson (Chemistry)

In an effort to move away from fossil fuel sources, the Jackson Group at MSU has been exploring ways of turning carbon generated from plants into fuel by means of electrochemical hydrogenation. In this process oxygen is removed from these carbon compounds and hydrogen is added. This increases their specific energy, which is the amount of energy contained per mass, measured in MJ/kg. Jackson's Group has cleverly designed a system that combines catalytic hydrogenation of organic molecules with the protons and electrons (necessary for the hydrogenation) generated from water oxidation, all in a continuous flow. Furthermore, using water oxidation as a means of generating protons and electrons is much cheaper (energetically) than the high temperature and pressure needed when using hydrogen gas for catalytic reduction. Ideally the cell could be run on a solar panel. This combination of processes into a single cell creates a series of engineering obstacles like: efficient methods of plating catalyst metals onto electrodes or membranes, separation of the electrodes with a membrane selective to hydrogen ions, exploration and experimentation of a vast number of catalytic metals in various setups and also influences of circuit design on the reaction process.

EFFECTS OF WASTEWATER TREATMENT PRODUCTS ON MALE FATHEAD MINNOW PHYSIOLOGY
Natasha Myhal
Home Institution: University of Minnesota at Morris
Category: Environmental Science and Natural Resources, Section 1
Poster: 176
Time: 1:00 PM - 2:45 PM
Mentor(s): Cheryl Murphy (Fisheries & Wildlife)

Wastewater treatment companies, in the process of cleaning up effluent, remove the synthetic estrogen ethynyl estradiol (EE2) found in hormonal contraceptives, and created a previously undetected conjugated form (ethynyl estradiol – sulfate (EE2-S)). Ethynyl estradiol (EE2), which is previously found in municipal wastewater, mimics a naturally producing estrogen, estradiol (E2), which has been causing the male fathead minnow to produce vitellogenin, a protein normally produced by female fishes and is a precursor protein to yolk. This significantly caused the male fathead minnow population to decrease. The waste management companies began to clean their waters of EE2, and in the process transformed EE2-S. Part of the process for detecting the concentrations of EE2-S is solid phase extraction (SPE) in which EE2-S will be extracted from water samples and then quantified using analytic techniques. My goal is to develop an extraction technique that will be used to detect EE2-S from water samples. My project is an integral part of bigger project where we test the effects of EE2-S on male fathead minnow vitellogenin production.

ANALYSIS OF PHENOTYPIC AND GENOTYPIC DIVERSITY OF PSEUDOMONAS AND AEROMONAS OF THE RED CEDAR RIVER, EAST LANSING, MI

Allison Chan
Home Institution: Michigan State University
Category: Environmental Science and Natural Resources, Section 1
Poster: 178
Time: 1:00 PM - 2:45 PM
Mentor(s): Terence Marsh (Microbiology)

Freshwater ecosystems are of critical value to all life on earth. The natural microbial populations of freshwater systems are diverse, seasonally dynamic and critical for a functioning ecosystem. The purpose of this study was to analyze phenotypic and genotypic attributes of Pseudomonas and Aeromonas populations in the Red Cedar River over a span of seven weeks. We hypothesized that these populations would vary over time, correlating with rain events or temperature. Samples were collected each week over a seven-week span and plated directly onto Pseudomonas agar that selects primarily for Pseudomonas and Aeromonas. Approximately 85 strains were randomly picked from each sampling for phylogenetic analysis using 16S rRNA and a subset was randomly picked for antibiotic sensitivity testing. The results showed that Pseudomonas dominated when river flow rates and rainfall were high. All strains were resistant to clindamycin, penicillin and ampicillin and sensitive to streptomycin, tobramycin, tetracycline, ciprofloxacin, and polymyxin B. All Aeromonas were sensitive to erythromycin and sulfamethoxazole/trimethoprim whereas pseudomonads were resistant. All pseudomonads were resistant to vancomycin and Aeromonas were mixed. The correlation of Pseudomonas to rainfall and river height suggests that runoff affects the population of Pseudomonas. In contrast to previous publications, that reported a high resistance to vancomycin within the Aeromonas genus, our results showed a mix between resistance and sensitivity. This suggests that vancomycin resistance has not been highly selected for within this environment. The trends that were observed from this study have led to further interest in pursuing analysis of this specific community.

AMPA RECEPTOR MRNA EXPRESSION IS ALTERED IN RAT SPINAL CORD AFTER METHYLMERCURY EXPOSURE

Alberto Perez-Medina
Home Institution: Michigan State University
Category: Environmental Science and Natural Resources, Section 1
Poster: 179
Time: 1:00 PM - 2:45 PM
Mentor(s): William B. Atchison (Pharmacology & Toxicology), Alexandra Colon-Rodriguez (Comparative Medicine & Integrative Biology)

Methylmercury (MeHg) is a common environmental neurotoxicant to which humans are exposed through the consumption of fish. MeHg exposure causes alterations in calcium (Ca2+) homeostasis on brain stem and spinal motor neurons; these are mediated by Ca2+permeable AMPA receptors, among other ion channels. The objective of this study was to determine the effects of MeHg exposure on the expression of the AMPA receptor subunits in spinal cord motor neurons. AMPA receptors subunits, GluR1-4 mRNA expression was measured by QPCR. Postnatal day five male Sprague Dawley rats were exposed subcutaneously to 0.75, 1.5 mg/kg/day MeHg, or 0.9 % NaCl (control). Exposure was maintained for 30 days, which was retained for an additional 30 days without further treatment (“clearing” period). QRT-PCR was performed on reverse transcript of total RNA isolated from 10 mg of lumbar and sacral spinal cord. Relative expression was calculated using the 2ΔΔCt method (Livak method), and normalized to the endogenous control (GAPDH) and the untreated controls. MeHg exposure alters mRNA expression of the most abundant GLUR subunits in spinal motor neurons. 30 days, 0.75 mg/kg/day MeHg exposure increased the expression of all the subunits. In the 1.5 mg/kg/day exposure group a similar but less pronounced increase occurred. The 60 day animals that had the 30 day “clearing” period also had an increase in expression after MeHg exposure. In conclusion, chronic exposure of neonatal rats to MeHg causes enduring changes in expression of GLUR subunits. These can affect the ability of motor neurons to regulate [Ca2+]i.

EFFECTS OF CHRONIC METHYLMERCURY EXPOSURE ON GLUTAMATE AND $GABA_A$ RECEPTOR EXPRESSION ON BRAINSTEM OF ADULT MICE

Zuleirys Santana-Rodriguez
Home Institution: University of Puerto Rico at Rio Piedras
Category: Environmental Science and Natural Resources, Section 1
Poster: 180
Time: 1:00 PM - 2:45 PM
Mentor(s): Alexandra Colon-Rodriguez (Comparative Medicine & Integrative Biology), William D. Atchison (Veterinary Medicine)

Methylmercury (MeHg) is an important environmental neurotoxicant that causes significant damage to developing and mature nervous system. Studies have demonstrated that MeHg causes alterations in synaptic transmission, $[Ca^{2+}]_i$ homeostasis, and $GABA_A$ receptor ($GABA_AR$) mediated synaptic inhibition. However the mechanisms underlying MeHg toxicity are not yet understood. In this study we are focused on determining the effects of chronic MeHg exposure on mRNA

expression and protein levels of the α1, β1, β3, γ2, and δ subunits of the $GABA_AR$; and the NR1 and NR2A subunits of the NMDA receptor (NMDAR) in mouse brainstem. The brainstem is an area rich in motor neurons, a recently identified target of MeHg toxicity. Balb/c mice were exposed to 0 ppm (control) or 5 ppm MeHg *ad lib* in drinking water for 12 months, starting when they were 90 days old. RNA and protein were isolated from 10 mg of brainstem tissue, and quantitative real-time PCR was performed in reverse transcript of the isolated RNA. Relative expression was calculated using the $2^{\Delta\Delta}$Ct method, which we normalized to the endogenous control GAPDH and the untreated controls. Chronic MeHg exposure caused alterations in the expression of the $GABA_AR$ and NMDAR subunits studied. The α1, and β1 of the $GABA_AR$ were downregulated, as well as the NR1 of the NMDAR. However the β3, γ2, and δ of $GABA_AR$; and NR2A of NMDAR were close to control levels. Downregulation of $GABA_AR$ and NMDAR subunits could be an indication of the mechanism of MeHg-induced alterations on Ca^{2+} homeostasis on motor neurons.

SORPTION OF CARBAMAZEPINE BY BIOCHAR

Azel King
Home Institution: Medgar Evers College
Category: Environmental Science and Natural Resources, Section 1
Poster: 181
Time: 1:00 PM - 2:45 PM
Mentor(s): Mark Bezdek (Plant & Soil Sciences)

The purpose of this research is to analyze the beneficial effects of biochar as a soil amendment. Evidence shows significant increase in the levels of pharmaceuticals in soil, resulting from the application of livestock waste, which has value as fertilizer, but often contain pharmaceuticals. Biochar is created during the pyrolysis of plant material at low oxygen concentrations. It is produced for carbon sequestration and as a byproduct of bio-fuels production. In this study, the sorption of the anti-depressant carbamazepine by char was studied. This compound was studied because it frequently occurs in natural waters. To quantify sequestration of carbamazepine by biochar, a batch equilibration method was used. This involves adding a series of aqueous carbamazepine solutions at different concentrations to a known mass of biochar contained in a glass centrifuge tubes. The samples were then centrifuged to separate the liquid and solid phases. A sample of the liquid phase was analyzed for its carbamazepine concentration, which is expected to be lower than the initial concentration, due to the removal of the compound from water by biochar. The carbamazepine concentrations were quantified using a high performance liquid chromatograph coupled to tandem mass spectrometers. The differences between the initial and final concentrations of carbamazepine in solution allows for the calculation of the mass sequestered by a unit mass of biochar. This quantifies carbamazepine's affinity for biochar, and provides perspective on the efficacy of biochar as a soil amendment to reduce transport of carbamazepine to ground waters and surface waters.

EPIDEMIOLOGY & PUBLIC HEALTH

A SCHOOL-BASED PHYSICAL ACTIVITY INTERVENTION FOR 6TH- AND 7TH-GRADE BOYS: REACH AND DOSE

Ashley Triplett
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 185
Time: 1:00 PM - 2:45 PM
Mentor(s): Lorraine Robbins (Nursing)

The purpose was to evaluate the reach and dose of Guys Only Activity for Life (G.O.A.L.), a 7-week pilot investigation to increase 6th and 7th grade boys' moderate-to-vigorous physical activity (MVPA). One middle school was randomly assigned to the G.O.A.L. intervention and another from the same urban school district to a comparison condition. Thirty boys, ages 10-14 years old, participated at each school. The intervention, guided by the Health Promotion Model and Self-Determination Theory, consisted of a 90-minute after-school physical activity (PA) club 4 days/week and one motivational interviewing session with a registered (school) nurse. To evaluate reach related to the PA club and motivational interviewing session, attendance was recorded. To determine the dose associated with the physical activity club, the process evaluator completed a lesson observation form to indicate the number of minutes spent in four areas: 1) instruction, 2) management, 3) seated activity, and 4) opportunity to engage in MVPA. To evaluate dose related to the motivational interviewing session, the nurse documented the date and duration of the session completed by each boy and audio-taped the sessions. On average, boys attended the club 2.11 days/week (SD=0.86). The process evaluator reported that the PA club instructors provided the boys with the opportunity for a mean of 25.8 minutes/day of MVPA. Because every boy attended the session with the nurse, reach was 100%. Sessions lasted an average of 13 minutes, 29 seconds. Process evaluation data indicated a need for strategies to increase attendance and boys' MVPA during the club time.

ANALYSIS OF A HIGH FRUCTOSE CORN SYRUP DIET ON NEURONAL PROLIFERATION IN MICE

Misty Harden
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 187
Time: 1:00 PM - 2:45 PM
Mentor(s): Cuihong Jia (Pharmacology & Toxicology)

Neurogenesis is crucial throughout one's life for injury recovery as well as sustaining brain function and perception. Not much research has been published on the effects of the diet on neurogenesis, motivating the research presented in this article. High fructose corn syrup is becoming more prevalent in Western diets, even though it is linked to neurological issues such as depression. We explored the effects of a high fructose diet on cell proliferation in the subventricular zone (SVZ) of the brain. 12 6-8 week old male c57 B/L6 mice were randomly separated into two groups (n=6) and fed either normal chow or a 60% fructose diet for 4 weeks. Their body weight, water, and food intake was monitored Monday to Friday. On the last day of treatment, all mice received one 5-bromo-2-deoxyuridine injection 2 hours before tissue collection. The mice were cardiac perfused with 4% paraformaldehyde followed by 0.1M phosphate buffer solution. The brains were post-fixed overnight with the PFA then cryoprotected with 10% sucrose. The brain was snap frozen, and coronal section of brain including SVZ (40μM) was collected. Immunohistochemistry using antibodies against BrdU was performed. We will quantify the number of cells incorportated with BrdU in brains from both the control and the high fructose group, and, using a student's t-test, analyze whether or not the high fructose diet created significant change in the amount of proliferating cells compared to control. We predict that the high fructose will cause a significant decrease in the number of proliferating cells.

THE ROLE OF SEROTONIN IN EPITHELIAL CELL PROLIFERATION AND APOPTOSIS IN THE MOUSE ILEUM

Melissa Chavez
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 188
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), Mark Kadrofske (Pediatrics & Human Development)

Background: Epithelial barrier integrity is important to prevent inflammation in the gastrointestinal (GI) tract. Most (> 90%) of whole body serotonin is localized in the GI tract where it is synthesized from tryptophan via the rate-limiting enzyme tryptophan hydroxylase type 1 (TPH-1). Serotonin levels and metabolism are altered in states of GI inflammation. We hypothesize that serotonin may alter epithelial cell proliferation and apoptosis and hence regulate barrier integrity. **Methods:** Wild-type (WT) and TPH-1$^{-/-}$ (KO) mice were injected (75 mg/kg; i.p.) with bromodeoxyuridine (BrdU) to label proliferating crypt epithelial cells. Sections of ileum were harvested three hours after BrdU injection and processed for immunohistochemistry (IHC). Apoptosis was measured by Western blotting for cleaved caspase-3. JEG3 cells treated with staurosporine (2.5 μM x 6 hrs.) served as a positive control for apoptosis. **Results:** We injected BrdU and harvested tissue from six WT and six KO mice. These tissue sections have been fixed, paraffin-embedded, and processed for IHC staining. The IHC staining technique for BrdU has been optimized and we are ready to compare crypt cell proliferation between the WT and KO mice. Cleaved caspase-3 (19, 17 kDa) bands were present in the staurosporine-treated JEG3 cells. We are currently evaluating apoptosis in mucosal extracts from the WT and KO mice. **Conclusions:** Our results may determine whether serotonin is an endogenous paracrine molecule regulating GI epithelial proliferation and/or apoptosis. **Support:** M.C. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

ARE SMOKING RATES DECLINING IN FEDERALLY QUALIFIED HEALTH CENTERS?

Indrea Joplin
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 189
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), Adesuwa Olomu (Medicine)

Background: Smoking is the leading cause of preventable illness and lung cancer deaths in America. It's also linked to cardiovascular disease (CVD) and other diseases. Recently, a Center for Disease Control study revealed that US smoking rates in adults is declining. Federally qualified ealth centers (FQHCs) provide care for low income and medically underserved populations. The objectives of this study are to 1) determine smoking rates among diabetics and CVD patients in FQHCs, 2) compare smoking rates between immigrants vs. non-immigrants, and 3) determine smoking cessation programs accessibility. **Methods:** This study is a secondary analysis of Office- Guidelines Applied in Practice Program, designed to improve secondary prevention of heart disease for diabetic/ CVD patients in Michigan FQHCs. We analyzed 242 patients that participated in group visits (September 2010 - December 2012) at baseline and completed their smoking status and smoking cessation programs access survey. **Results:** Overall 31.4% patients were current smokers; 35.3% Blacks, 41.7% whites, and 12.1% of Other races. 39.01% non-immigrants and 8.33% immigrants ($p<0.0001$) were smokers. 63.64% of MI patients, 28.1%

Diabetics and 48.65% asthmatics were smokers. 69.74% expressed having problems accessing smoking cessation programs. Smoking rates remain high, with many patients reporting difficulty in accessing smoking cessation programs in FQHCs. **Conclusions:** Smoking rates are significantly higher among non-immigrants compared to immigrants. There is an urgent need to improve access to smoking cessation programs in FQHCs. **Support:** I.J. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

STRESS AXIS ACTIVATION BY EXPOSURE TO OZONE IS AFFECTED IN THE BACKGROUND OF DIET-INDUCED OBESITY

Audrey Meredith
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 190
Time: 1:00 PM - 2:45 PM
Mentor(s): Elahé Crockett (Medicine), PS Mohankumar (Pharmacology & Toxicology), Sheba Mohankumar (Pharmacology & Toxicology)

Background: Studies have demonstrated that exposure to ozone (O3) can induce cardiovascular disorders in humans. It is likely that such cardiovascular disturbances are linked to activation of the stress axis. However, there are no studies examining the effects of O3 exposure on stress axis activity. We hypothesized that O3 exposures in animals would cause an increase in stress axis activity. Since cardiovascular diseases are associated with obesity, we were interested in determining if O3 exposures in obese animals would result in further activation of the stress axis. **Methods/Results:** Adult male Sprague Dawley rats were placed on a normal or high fructose diet for 6-weeks. One group was also treated with Metformin to manage blood glucose levels. After six weeks of treatment, they were exposed to either ozone or air for 5 days. Twenty-four hours after the last exposure, animals were euthanized, their brains harvested, frozen, sectioned and micro dissected. Different brain nuclei associated with stress axis activity such as the paraventricular nucleus, bed nucleus of the stria terminalis, Central amygdala etc., were analyzed for neurotransmitters that increase stress axis activity using HPLC-EC. We anticipate the results will demonstrate that exposure to O3 does increase neurotransmitter levels in these nuclei suggesting activation of the stress axis. We also expect that stress axis activity will further increase in obese animals after O3 exposure. Treatment with Metformin is expected to counter these effects. **Support:** A.M. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

WORK-RELATED HOMICIDES IN MICHIGAN

Mia Cook
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 1
Poster: 191
Time: 1:00 PM - 2:45 PM
Mentor(s): Debra Chester (Medicine), Elahé Crockett (Medicine), Melissa Millerick-May (Medicine), Kenneth Rosenman (Medicine)

Background: Homicides in the workplace is an issue of concern in Michigan and throughout the US. Since 2001, researchers at Michigan State University have tracked demographic information and causes of work related homicides in the State of Michigan. Our research goal was to study work-related homicides in Michigan. **Methods/Results:** The sources used to identify the work related deaths include death certificates, medical examiner and police reports, newspapers, and online sources such as Crime Stoppers, and Weekly Toll. From 2001 through 2012 there were 219 work related homicides in 26 counties. The largest number of work related homicides were Wayne (140), Oakland (19), Genesee (8), Macomb (7) and Washtenaw County (7). Industries with the largest work related homicides were: retail trade (61), accommodations and food services (31), and public administration (25). A gun was involved in 74% of the work related homicides and a knife was used in 8% of the incidents. Blacks had the highest work related homicides incidence rate per 100,000 employed (14.3) followed by Asian descent (11.9), whites (3.5), and Hispanics (1.24). The incidence rate for men per 100,000 was 7.9 and for women 1.3. Over the past 12 years the incidence of work related homicides has fluctuated, with a recent increase in the past 2 years. Guidelines for preventing work related homicides have been developed for high risk workplaces, and will be summarized and distributed to employers and employees. **Support:** M.C. is a REPID scholar with training support from an NIH-award to Elahé Crockett, REPID Program Director.

OBESITY AND ACCESS TO COMMUNITY RESOURCES IN FEDERALLY QUALIFIED HEALTH CENTERS IN MICHIGAN

Kyrah Holland
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 192
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Bikki Gautam (Medicine), Adesuwa Olomu (Medicine)

Background: Obesity in US has been on a rise and is linked to life threatening health problems such as diabetes, hypertension, cardiovascular disease (CVD) and cancer. Recently, the American Medical Association classified obesity as a disease. Federally qualified health centers (FQHCs) provide care for low income and medically underserved populations. The objective of this study is to determine if obese diabetic and CVD patients in FQHCs have access to community resources for weight loss. **Methods:** This study is a secondary-analysis of the Office- Guidelines Applied to Practice, designed to improve secondary prevention of heart disease for diabetic and CVD patients in FQHCs in Michigan. We analyzed 242 patients that participated in group visits (September 2010-December 2012) at baseline and completed a survey regarding having access to weight loss programs and nutrition counseling. **Results:** 53.71% of all the patients were obese (BMI > 30). Mean age 53.69%; 33.07% male, 47.69% whites. 55.85% of diabetics, 57.06% of hypertensives and 57.57% of MI patients were obese. Only 57.42% and 62.5% patients had access to weight loss programs and nutrition counseling respectively. Further, 78.46% and 61.54% patients stated problems getting into weight loss and nutrition counseling programs respectively. **Conclusions:** High proportions of diabetic and CVD patients are obese in FQHCs. Many lack access to programs that assist with weight loss. There is an urgent need to improve access to community resources for patients in FQHCs. **Support:** K.H. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

CAMPYLOBACTER JEJUNI COLONIZATION AFFECTS ON THE NORMAL MICROBIOTA OF C57BL/6 WILD-TYPE MICE WITH HUMAN MICROBIOTA

Trey Gilpin
Home Institution: California State University San Marcos
Category: Epidemiology and Public Health, Section 2
Poster: 193
Time: 3:15 PM - 5:00 PM
Mentor(s): Julia Bell (Large Animal Clinical Sciences), Linda Mansfield (Large Animal Clinical Sciences)

The normal microbiota that reside in our bodies are an integral part of our immune system in that they have many different functions to help maintain health. One function of interest is how they serve as a barrier against pathogens. The normal microbiota in our gastrointestinal tract can provide colonization resistance against pathogens by competitive exclusion. Past research shows that the pathogen Salmonella is able to change human normal GI tract microbiota to allow the promotion of disease. These changes can involve the presence or absence as well as abundance of intestinal microbiota. We aim to determine if colonization by Campylobacter jejuni, a pathogen that causes enteritis in humans, affects the microbiota of C57BL/6 wild-type mice with human microbiota. We hypothesize that C. jejuni colonization of C57BL/6 WT human-microbiota mice altered the fecal microbiota in mice colonized by C. jejuni strains 11168 and 260.94 compared to C57BL/6 WT human-microbiota mice given trypose soya broth but not the fecal microbiota of either C57BL/6 WT or C57 IL-10 deficient mouse-microbiota mice infected with C. jejuni 11168. In conducting this study, a QIAamp DNA Stool Kit from QIAGEN was used to isolate DNA from each sample and was measured using a NanoDrop ND-1000 Spectrophotometer. Last, qPCR will be run with all samples that will give us the quantity of each type of 4 major groups of microbiota in each sample, allowing us to identify changes among the proportions of the groups in microbiota.

NAVIGATING THROUGH THE MENU VIA FAST-FOOD RESTAURANT CHOICES

Rebekka Pace
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 194
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Statistics & Probability)

The purpose of this research is to explore the fast-food menus providing correlations between calorie content and nutrient content. This project was done using a linear regression model. It also provides statistics on cardiovascular disease and other health risks due to fast food consumption.

TELAMON MICHIGAN MIGRANT HEAD START NUTRITION NEEDS ASSESSMENT PROJECT

Violeta Nieves
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 195
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Won Song (Food Science & Human Nutrition)

Background: Migrant Seasonal Farm Workers (MSFW) face innumerable hardships including but not limiting to low wages, long hours, enduring many job hazards, poor living conditions, all of which result in unique challenges of health and nutrition risks. Support services such as Telamon Michigan Migrant Head Start (MMHS) Corporation strive to help children of MSFW families who are bound to these adverse situations. Telamon, in collaboration with Michigan State University Department of

Food Science and Human Nutrition, evaluated the nutritional needs of MSFW's children internal factors (parents and MMHS staff). The aim of this study was to identify specific problems in nutritional intake, nutritional knowledge, food insecurity, dietary behavior, and child feeding practices in parents and MMHS staff and test how these factors influence dietary behaviors of MSFW's children. **Methods/Results:** Parents having at least one child (aged 0-5 years, n=150) and staff members (teachers, assistant teachers, etc., n=250) were recruited from 17 Telamon MMHS Centers in Michigan. Online nutritional needs assessment survey and Automated Self-administered 24-hour Recall (ASA24) were assessed by Statistical Analysis Software 9.3 (SAS) in the summer of 2013. The data are currently under review/ analysis, and will be discussed during presentation. **Support:** V.N. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

OZONE INDUCED INCREASES IN NASAL EPITHELIAL MUCOSUBSTANCES IS UNAFFECTED BY A HIGH FRUCTOSE DIET

Angel Trevino
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 196
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Jack Harkema (Pathobiology & Diagnostic Investigation)

Introduction: Repeated inhalation exposures to high ambient concentrations of O3 cause an adaptive epithelial change, mucous cell metaplasia (MCM), in the nasal airways of rodents. Since airway mucus is a known anti-oxidant, MCM is thought to be a defensive tissue response to minimize further oxidant airway injury caused by this inhaled irritant. The present study was designed to determine the effect of a high fructose diet (HFD) on the adaptive MCM response to O3. **Methods:** C57BL/6 male mice were exposed to 0 (controls) or 0.5 ppm O3, 4h/day, for 24 or 64 consecutive weekdays. Half of the mice were fed a normal diet (ND) and the other half was fed a HFD. Mice were euthanized 24h after the last day of O3 exposure. Nasal tissues were processed for light microscopy and morphometric analysis of intraepithelial mucosubstances. **Results:** No exposure-related nasal lesions were found in filtered air-exposed control mice fed either diet. In contrast, ND-fed mice exposed to O3 for 24- or 64-days developed marked MCM in nasal epithelium. HFD-fed mice had marked MCM after 64-days, but only minimal MCM after 24-days, with significantly less amounts of intraepithelial mucosubstances compared to ozone-exposed ND-fed mice. **Summary & Conclusions:** a HFD transiently altered the MCM adaptation of nasal epithelium to O3 exposure in mice. Underlying mechanism(s) responsible for this diet-induced alteration in host response and its possible human health implications are yet to be determined. **Support:** A.T. is a REPID scholar with training support from an NIH-award to Elahé Crockett, REPID Program Director.

MATERNAL DEPRESSIVE SYMPTOMS IN PREGNANCY AND ITS ASSOCIATION WITH CHILD TEMPERAMENT

Huei-min Ni
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 197
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Medicine), Claudia Holzman (Epidemiology & Biostatistics)

Background: Recent studies have shown that infants and/or children of mothers who have depressive symptoms during and after pregnancy are likely to demonstrate greater signs of negative affects in temperament. The objective of this study is to examine the association between prenatal maternal depressive symptoms and child temperament. **Methods/Results:** Data were collected from a sub-cohort study of 1,371 pregnant women who were enrolled in a longitudinal cohort known as the Pregnancy Outcomes and Community Health (POUCH) Study. Maternal depressive symptoms during pregnancy were assessed using the CES-D questionnaire in 1,365 women. Of these, 816 women participated in the POUCH follow-up Child Survey which assessed maternal reports of child temperament by looking at three dimensions (Negative Affectivity, Surgency, and Effortful Control) during the ages of three to nine years old using the Children's Behavior Questionnaire (CBQ). We found that, after adjusting for child age and gender, CES-D was associated with Child's Negative Affectivity (mean for CES-D< 16 = 3.86, mean for CES-D≥ 16 = 4.32; p-value <0.0001), but not with Child Surgency or Effortful Control. Possible explanations for these findings include bias reporting by mothers with depressive symptoms, fetal exposure to depression-related medication or hormonal changes in utero, shared genetic susceptibility, mother's lack of social interactions/ resources and or early mothering behavior that affect child interactions/bonding. **Support:** H.N. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

CARDIOVASCULAR DISEASE: EDUCATION AND ETHNICITY

Andie Williams
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 2
Poster: 198
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

This research project involves looking at three specific cardiovascular diseases. I looked at heart attacks, diabetes, and strokes. With these three, I compared level of education. I took each disease and looked at how likely a person with no high school diploma, a high school diploma, and a collegiate degree was to get each disease. With ethnicity, I took Blacks, Whites, and Hispanics and also compared their chances of getting each diseases. To do my calculations, I used a chi- square test to find my p- value.

PESTICIDE TRAINING AND PREVALENCE OF DIABETES IN MICHIGAN MIGRANT HEAD START MOTHERS

Cierra Coe
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 3
Poster: 199
Time: 3:15 PM - 5:00 PM
Mentor(s): Elahé Crockett (Human Medicine), Won Song (Food Science & Human Nutrition)

Background: Previous published articles have reported higher levels of organochlorine pesticides in Mexican Americans and this may potentially be a great influence in having more than a fifty percent chance of developing diabetes in non-white Hispanics. This has sparked the interest to develop more research on pesticides in order to get a better understanding between pesticide training and developing diabetes in reproductive aged women. There are seven specific pesticides commonly found in correlation with diabetes in Mexican-Americans which are as follows: aldrin, chlordane, heptachlor, dichlorvos, trichlorfon, alachlor, and cyanazine. The goal of our study is to evaluate the association between pesticide training and prevalence of diabetes in Michigan Migrant Head Start mothers. **Methods/Results:** Michigan Migrant Head Start mothers (n=99) who had completed Telamon Corporation/March of Dimes 2012 Health Families/Healthy Babies Survey were included in the data collection. A Chi-Square test will be performed to evaluate the relationship between pesticide training and the prevalence of diabetes. All statistical analyses will be performed using SAS 9.3. **Support:** C.C. is a REPID scholar with training support from an NIH award to Elahé Crockett, REPID Program Director.

BORN IN THE USA: OCCURRENCE OF BIDI USE IN THE US

Karl Christian Alcover
Home Institution: University of Hawaii at Manoa
Category: Epidemiology and Public Health, Section 3
Poster: 200
Time: 3:15 PM - 5:00 PM
Mentor(s): James Anthony (Epidemiology & Biostatistics)

This research project has two parts. The initial part focuses on epidemiology of bidi smoking in the United States, and the second part is focused on behavioral health characteristics of the United States (US) population from the Pacific Islands, with a special focus on the Philippines. Both projects required mastery of health survey research methods required to produce epidemiological estimates and to draw valid inferences from those estimates. The data are from large multi-stage area probability sample surveys designed to yield nationally representative samples of US non-institutionalized community residents age 12 years and older. The assessments are from confidential self-administered computerized questionnaires completed in each participant's dwelling unit. In the initial project, the task has been to estimate experience with smoking of bidis, which are small hand-rolled cigarettes. We expect that US young people from India and other countries of southern Asia will have greater occurrence of bidi smoking than their US peers due to social norms in southern Asia that are more favorable to bidi smoking and greater bidi smoking prevalence in those parts of the world. The second project will provide a more comprehensive look at the behavioral health of the US Pacific Islanders, encompassing bidi smoking, but also extended to the use of other drugs, depression and related neuropsychiatric illnesses, and health conditions diagnosed by clinicians who have examined the survey participants. We will form the specific research questions for this second project once an initial paper on bidi smoking has been drafted in early July.

TO PARTICIPATE OR NOT TO PARTICIPATE: EDUCATING MICHIGANDERS ABOUT THE BIOTRUST AND THEIR CHOICES

Audrey Wilson
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 3
Poster: 201
Time: 3:15 PM - 5:00 PM
Mentor(s): Meta Kreiner (Anthropology Social Science), Ann Mongoven (Center for Ethics and Humanities in the Life Sciences)

Health research often comes across as complex, unapproachable, or simply unknown to the average citizen. This project is aimed to inform Michiganders about a health resource that directly affects them: the Michigan BioTrust for Health, a research biobank of blood samples leftover from newborn screening. Millions of Michiganders have blood samples in the BioTrust, however few are aware of this. This project rooted itself in community engagement in order to create accessible, interactive citizen education about a current issue in science policy. In 2011, seven deliberative juries occurred to discuss the BioTrust and its consent processes for research participation. Using these deliberations as a building block, a tool to be used by community organizations was developed. The pilots of this educational resource were released in spring of 2013, with goals of accessibility, helping Michiganders make their choice, and providing a vehicle for feedback. This was done through the visual design of the tool, as well as integrating technology that allows cell phones to be used as an audience response system. Feedback from the tool will express the hopes and concerns of Michiganders about the BioTrust, as well as assist in determining next steps for continuing to raise awareness.

CERVICAL CANCER AWARENESS AMONG BLACK, LATINA AND ARAB WOMEN

Desirae Smith
Home Institution: Langston University
Category: Epidemiology and Public Health, Section 3
Poster: 202
Time: 3:15 PM - 5:00 PM
Mentor(s): Karen Williams (Obstetrics, Gynecology & Reproductive Biology)

Despite the benefits of early detection, Black, Latina, and Arab women have dramatically lower rates of cervical cancer screening than Non-Hispanic White women. Lower screening rates are associated with a more advanced stage at diagnosis and increased mortality. Research suggests that lower cervical cancer screening rates may be related to lower levels of cervical cancer awareness. The purpose of this study was to examine cervical cancer awareness among Black, Latina and Arab women. Data from the Kin KeeperSM Cancer Prevention Intervention randomized controlled trial were analyzed among Black (n=216), Latina (n=65) and Arab (n=233) women. The Cervical Cancer Literacy Assessment Tool (C-CLAT) was used to measure cervical cancer awareness. Cervical cancer screening and socio-demographics characteristics were measured using a questionnaire developed for this study. Descriptive statistics and logistic regression were used to determine if awareness was a predictor for cervical cancer screening. Latina women had lower cervical cancer awareness (29.23%) than Arab (35.62%) and Black (40.28%) women. Women who had higher levels of cervical cancer awareness were more likely to be screened for cervical cancer (p=0.036). Cervical cancer awareness is a predictor of screening behavior. These findings suggest that Black, Latina and Arab women may benefit from additional information regarding cervical cancer screening and guidelines. There is a need to continue targeted research to improve cervical cancer screening among Black, Latina, and Arab women to decrease mortality rates in these vulnerable populations.

OBESITY AND SERUM ANALYTES AS PREDICTORS OF DIVERTICULOSIS IN ADULT MALES

Markita Lewis
Home Institution: Louisiana State University
Category: Epidemiology and Public Health, Section 3
Poster: 203
Time: 3:15 PM - 5:00 PM
Mentor(s): Sarah Comstock (Food Science & Human Nutrition), Jenifer Fenton (Food Science & Human Nutrition)

Diverticulosis is the first stage of diverticular disease, a condition of the colon which leads to inflammation and other complications. Serum concentrations of cytokines may serve as biomarkers to detect and diagnose diverticulosis. Anthropometric measures may also influence diverticulosis. We sought to identify anthropometric or serum markers that were associated with the presence of diverticulosis upon colonoscopy. To determine the associations between obesity, cytokines and the presence of diverticulosis, 126 asymptomatic men (48-65 yr) were recruited at the time of colonoscopy. Anthropometric measures as well as blood were collected. Polytomous logistic regression was run on variables of age, smoking status, obesity status, and protein concentrations. The odds of obese individuals having diverticulosis was 7.3 (CI: 2.2-24.5) times greater than those of a lean (BMI <25) individual. Serum soluble receptor for advanced glycation end products (sRAGE) was inversely related to having diverticulosis, with individuals having a 0.4 (CI: 0.3-0.7) lower chance with each tertile increase in concentration. Smoking was associated with having diverticulosis in the sigmoid colon in all variables

measured. Identification of anthropometric (BMI) and serum analytes (sRAGE) associated with diverticulosis would enable diagnosis by non-invasive procedures and diagnosis prior to presentation with disease complications, thereby reducing the cost of diagnosis and treatment for diverticular disease.

PRE-PREGNANCY BMI, FOLLOW-UP BMI, WAIST CIRCUMFERENCE, AND ITS ASSOCIATION WITH ANTEPARTUM DEPRESSION: FINDINGS FROM POUCH

Shelbie Shelder
Home Institution: Michigan State University
Category: Epidemiology and Public Health, Section 3
Poster: 204
Time: 3:15 PM - 5:00 PM
Mentor(s): Claudia Holzman (Epidemiology & Biostatistics)

The aim is to study antepartum depressive symptoms in relation to maternal anthropometrics in both pre-pregnancy and at 7-15 years post-pregnancy. Risk factors associated with antepartum depression vary, and are not consistent across studies. First, we examine associations between pre-pregnancy body mass index, post-pregnancy BMI, waist circumference after pregnancy, and antepartum depressive symptoms. This analysis used data from The Pregnancy Outcomes and Community Health Study which included 3,019 women from 5 clinics in 52 different Michigan communities. At enrollment (16-27 weeks gestation) depressive symptoms were measured using the CES-D (Center for Epidemiologic Studies Depression Scale) and pre-pregnancy BMI was calculated from self-reported height and weight. CES-D was categorized as a standard cutoff of high ≥ 16 and not high < 16. 300 of the 3,019 women were reexamined at 7-15 years post-pregnancy and direct measures were obtained for height and weight of the women. High CES-D (≥ 16) was associated with pre-pregnancy BMI categories of underweight (<18.5) aOR =1.9 (95% CI 1.2,2.9) and obese (≥ 30) aOR = 1.3 (95% CI 1,1.6) in White/Other women but not in African American women. At follow-up high CES-D in pregnancy (≥ 16) was related to high BMI in both White and African American Women. If we are able to identify risk factors early on, we can prevent the outcome from happening. Physicians should make it a priority to screen for depressive symptoms during gravidity.

INTEGRATIVE BIOLOGY

EFFECTS OF TESTOSTERONE ON MOUSE BRAIN ORGANIZATION

Gerard Miller
Home Institution: Northern Michigan University
Category: Integrative Biology, Section 1
Poster: 210
Time: 3:15 PM - 5:00 PM
Mentor(s): Nick Hobbs (IBSB)

Sex hormones such as testosterone (T) can masculinize the male brain during development. It was originally thought that T organized the brain via conversion to estradiol and binding with estrogen receptors. However, recent evidence suggests that T may also masculinize the brain directly by binding to androgen receptors (AR). During adulthood, T activates male-typical behaviors, which include mounting and investigation of female odors. We are testing the hypotheses that AR is necessary to organize the brain during development for the sexual differentiation of olfactory cues and that hormones are necessary during adulthood to activate partner preference behavior. Male and female mice will be gonadectomized after puberty, and given either a T capsule or a blank capsule. Subjects will then be placed in a Y-maze and undergo a partner preference test with a female scent donor in one arm and a male scent donor in the other. Differences in the amount of time spent investigating scent donors between male and female subjects given T may suggest a role for AR in organizing the brain to respond to olfactory cues, as females express fewer ARs. Subjects given blank capsules will serve as a control group, to support evidence that sex hormones are necessary to produce these olfactory discriminations by the subjects. We predict that males given T will spend more time investigating the arm with the female scent donor, while we expect the females given T and the control group to show no preference, supporting our hypothesis.

PHENOTYPES OF PUBERTALLY BORN CELLS IN THE ARCUATE NUCLEUS OF MALE AND FEMALE RATS

Hector Manuel Cay Bonilla
Home Institution: University of Puerto Rico at Cayey
Category: Integrative Biology, Section 1
Poster: 211
Time: 3:15 PM - 5:00 PM
Mentor(s): Margaret Mohr (Neuroscience), Cheryl Sisk (Neuroscience, Psychology)

The plasticity of the mammalian brain has been confirmed with the addition of new cells (including neuro- and glio-genesis) during puberty in many brain regions. The arcuate nucleus of the hypothalamus contains many groups of neurons that are involved in important physiological processes such as energy balance regulation. Previous research has confirmed that

neurogenesis occurs in the arcuate nucleus of adult mice, specifically at the base of the third ventricle. Moreover, recent research has shown that new cells are added to the arcuate nucleus during puberty in hamsters, revealing that ~30% of them are glial cells and ~5% of them are mature neurons. At present, no studies have explored pubertal cell addition in the arcuate nucleus of rats. For this reason, we injected male and female rats on post-natal day 30 with the cell birth-date marker bromo-deoxyuridine (BrdU) to identify pubertally born cells and sacrificed the animals on post-natal day 72. To identify the phenotypes of the newly added cells we used immunohistochemistry technique, performing triple-label immunofluorescence with BrdU, the glial marker Glial fibrillary acidic protein (GFAP) and the neuronal marker neuronal specific nuclear protein (NeuN). Also, sex differences in addition of new cells during puberty have been reported. Therefore, we also seek to explore if there are sex differences in phenotypes of the newborn cells. Results from this study will shed light on the potential functions of newly added cells in the arcuate nucleus during puberty.

RANK-RELATED VARIATION IN OXIDATIVE STRESS AMONG WILD SPOTTED HYENAS

Desiree Outten-Berrios
Home Institution: North Carolina State University
Category: Integrative Biology, Section 1
Poster: 212
Time: 3:15 PM - 5:00 PM
Mentor(s): Kay Holekamp (Zoology), Nora Lewin (Zoology)

Oxidative stress is not only known to cause cellular senescence, but also naturally occurring chemical damage to DNA. Reactive oxygen species are normal byproducts formed from cellular activity. However, if this production continues without adequate defense to prevent damaging effects, chronic oxidative stress can potentially result in harm to DNA, such as shortening of telomeres on chromosomes. Oxidative stress is mediated by a number of external and internal factors. An animal's low social rank can potentially cause oxidative stress because of psychological stress, poor access to nutrition, and life-history tradeoffs. Spotted hyenas (Crocuta crocuta) are large, social carnivores that live in groups in which an animal's dominance rank is maternally inherited, and aggression is used to enforce the hierarchy. This study will determine whether an individual hyena's rank is correlated with the amount of oxidative damage present in its plasma. Blood was collected from wild spotted hyenas living in the Masai Mara National Reserve in Kenya. Enzyme-linked immunosorbent assays (ELISA) were used to assess the amount of oxidatively damaged guanine species present in plasma. Due to the complex nature of studying a wild large mammal or a social hierarchy, measurement of oxidative stress is a more inclusive technique for assessing an animal's state of health than body condition alone. This work is important for developing an animal model of oxidative stress that we hope will be useful in wildlife conservation efforts, but also in assessment of diseases and senescence associated with oxidative stress, thus having useful implications for human medicine.

EFFECTS OF LIGHT ON BEHAVIOR IN DIURNAL NILE GRASS RATS (ARVICANTHIS NILOTICUS) AND NOCTURNAL LONG EVANS RATS (RATTUS NORVEGICUS)

Michael Jarecke
Home Institution: University of North Carolina at Charlotte
Category: Integrative Biology, Section 1
Poster: 213
Time: 3:15 PM - 5:00 PM
Mentor(s): Jennifer Langel (Neuroscience), Laura Smale (Psychology)

Light can have acute effects on behavior and physiology, a phenomenon known as masking. The masking effects of light differ between diurnal and nocturnal species, with light increasing arousal in diurnal species and decreasing arousal in nocturnal ones. Understanding how light can alter behavior and physiology is important, since many human health issues, such as disrupted sleep/wake cycles and seasonal affective disorder, are related to changes in environmental lighting conditions. To gain a better understanding of how light can affect arousal and sleep patterns in diurnal versus nocturnal species, we used video recordings to monitor behavioral responses to 1hr light pulses given 4hrs after lights off in 12:12 light-dark cycle in the diurnal Nile grass rat (Arvicanthis niloticus) and the nocturnal Long Evans rat (Rattus norvegicus). We compared the animals' behavior in response to the light pulse to that shown during a no-light pulse night. The video recordings were scored for sleeping, resting, exploring, rearing, grooming, eating, and drinking. The analysis of the masking responses to light in the Nile grass rat and Long Evans rat are currently in progress. In addition to behavioral analysis, the lab focuses on understanding the neural mechanisms that mediate the masking effects of light. Of interest is the role of specialized subpopulation of retinal ganglion cells that use the neurotransmitter adenylate cyclase-activating polypeptide (PACAP) to communicate with the brain. Such cells are important for non-image-forming visual functions in nocturnal rodents and may play a similar role in diurnal mammals.

CIRCADIAN REGULATION OF ACQUISITION AND OBJECT RECOGNITION IN A DIURNAL SPECIES, THE NILE GRASS RAT

Joel Soler
Home Institution: University of Puerto Rico at Cayey
Category: Integrative Biology, Section 1
Poster: 214
Time: 3:15 PM - 5:00 PM
Mentor(s): Carmel Martin-Fairey (Neuroscience), Antonio Nuez (Neuroscience)

Circadian rhythms are driven by an animal's internal biological clock and when entrained to the day-night cycle produce overt rhythms in behavior and physiological processes that display a 24-hour period. The suprachiasmatic nucleus (SCN) functions as a circadian pacemaker and controls a multitude of rhythms including those in learning and retention, which also involve other brain regions such as the hippocampus. Traditional nocturnal lab rats have been tested with object recognition tasks to determine their optimal time of day for learning and remembering. The results show that rats trained during the night perform better than rats trained during the day. In order to gain a better perspective of how circadian rhythms affect these processes, we decided to work with a diurnal species in an attempt to assess this issue. In the current study intact Nile grass rats (Arvicanthis niloticus) are being used as a preliminary step to determine if they are able to distinguish a familiar object from a novel object using a Non-Matching-to-Sample (NMTS) task. Half of the grass rats will be trained during the day, and the other half will be trained at night. We predict that grass rats trained during the day will be able to identify a novel object more effectively than those trained at night. Our data collection is currently in progress, but preliminary results suggest that grass rats being trained in the AM cohort are able to identify a novel object faster than grass rats trained in the PM cohort.

SOCIAL COGNITION CAPABILITIES IN THE THREE-SPINED STICKLEBACKS OF CRANBY LAKE, BRITISH COLUMBIA

Ashley Lindo
Home Institution: University of Miami
Category: Integrative Biology, Section 2
Poster: 215
Time: 3:15 PM - 5:00 PM
Mentor(s): Jason Keagy (Zoology)

Three-spined stickleback fish (Gasterosteus aculeatus) invaded multiple lakes in British Columbia in two separate waves; because of adaptation to different food and spatial preferences, they then evolved into different ecomorphs. "Benthics" are round-bodied fish named for their time spent on the bottom sediment area, while "limnetics" are thinner and forage in the water column. However, Cranby Lake does not contain these distinct ecomorphs, but a population of fish who are ecologically and morphologically variable. Not much is known about Cranby Lake's unique sticklebacks, including their cognitive abilities or behavioral patterns. This study focused on their capabilities to utilize local enhancement — the most basic foraging strategy in which fish use behavioral cues from other fish to determine where food sources are located. Past experiments indicated that Cranby Lake sticklebacks use social information in a unique and surprising way by avoiding the side where food had previously been located. In this experiment, we redesigned the tanks to also indicate whether these fish prefer to associate with the shoals that show the most behavioral cues regarding food location. Currently, we focus on how female sticklebacks in different reproductive states use social information. We predict that reproductive sticklebacks are more likely than non-reproductives to use local enhancement because of the greater costs to receiving private information and their tendencies to be risk adverse. We will discuss how our results relate to evolution of social learning strategies.

CHEMOSENSORY DETECTION OF TETRODOTOXIN IN THE ROUGH-SKINNED NEWT (TARICHA GRANULOSA)

Justin Merkel
Home Institution: Michigan State University
Category: Integrative Biology, Section 2
Poster: 216
Time: 3:15 PM - 5:00 PM
Mentor(s): Heather Eisthen (Zoology)

Tetrodotoxin (TTX) is a potent blocker of voltage-gated sodium channels, and is therefore one of the most lethal toxins known. Generally, TTX is used as a defense mechanism, although some animals that produce it are able to taste and smell it and some are even attracted to it. The rough-skinned newt (Taricha granulosa) produces and secretes TTX, and possibly uses the toxin to communicate with conspecifics. In the wild, newts group together and these aggregations will contain anywhere from a few individuals to thousands of newts. We are determining whether newts are attracted to TTX and are able to sense it through their olfactory system. We are using a circular enclosure divided into equal segments, with TTX (at a range of concentrations between 1 nM and 10 μM) and a control odorant located at opposite sides. We are measuring how much time the newts spend in each segment relative to the odorants. We are also quantifying locomotion, standing still, digging, and nose-tapping. Our preliminary behavioral data suggest that newts are attracted to TTX. Preliminary electrophysiological data suggest that TTX evokes an odorant response in only half the newts. Currently, we are executing more behavioral trials and

correlating the results with those from electrophysiology experiments to compare the data within individuals. These studies will guide future experiments revolving around chemical communication and electrical signaling in the olfactory system, and will shed light on the evolutionary changes required to enable newts to use a neurotoxin as a chemical signal.

"BEE-HAVIOR": AN EXPERIENCE IN THE INTEGRATIVE BIOLOGY OF SOCIAL BEHAVIORS AT MICHIGAN STATE UNIVERSITY

Amy Fontaine & John Kochiss
Home Institution: Humboldt State University, Michigan State University
Category: Integrative Biology, Section 2
Poster: 217
Time: 3:15 PM - 5:00 PM
Mentor(s): Fred Dyer (Zoology), Kristen Risley (Zoology)

The waggle dances of forager honey bees (*Apis mellifera*) returning to the hive indicate the location of a resource to nestmates who follow the dancer's movements. We hypothesized that dances indicating a specific resource would start and end around the same time, allowing followers who lose a dancer more options for accessing the information in the dance. If so, the latency for followers to switch dancers would be shorter with increased proximity to other dancers. We analyzed footage from observation hives for the presence of temporal dance clustering and its use by follower bees. The hives contained free-flying, unmarked bees who foraged at natural food sources. We used frame-by-frame analysis of videos in Quicktime 7 to measure dance angles of bees and estimate duration of waggle runs, allowing us to determine which dances point to the same resource. Then we examined the comparative start and end times for these dances and how follower behavior related to dancer proximity.The results may have implications for the overall understanding of dance synchrony and communication within honey bee hives.

ISOLATION AND IDENTIFICATION OF TETRODOTOXIN-PRODUCING BACTERIA IN THE ROUGH-SKINNED NEWT, TARICHA GRANULOSA

Alyssa Garvey
Home Institution: University of New Haven
Category: Integrative Biology, Section 2
Poster: 218
Time: 3:15 PM - 5:00 PM
Mentor(s): Patric Vaelli (Zoology)

Microorganisms are ubiquitous and many live symbiotically with host animals. These microbes are important for an animal's evolution and can provide metabolites, including defensive toxins, that can benefit the host. Tetrodotoxin (TTX) is a bacterial toxin that blocks voltage-gated sodium channels to prevent neurons from firing action potentials. Diverse organisms possess TTX, and the rough-skinned newt (Taricha granulosa) has the highest concentration of TTX found in nature. This high concentration has provided the newt with a potent anti-predator defense, except when it comes to the red-sided garter snake (Thamnophis sirtalis), some populations of which have evolved resistance to TTX. Although it is clear that these newts possess TTX, the origin and means of synthesis of this neurotoxin in newts remain unclear. We are working to isolate representatives of the bacterial communities on the newt's dorsal epithelium using ecologically-guided cultivation techniques. We have successfully isolated a vast array of bacteria from the epithelium. Using 16S rRNA sequences, we assessed the phylogenetic similarity of our isolates to known TTX-producing bacteria. These studies will guide future chromatographic and spectrometric analyses of TTX production by newt bacteria that will allow us to identify the organisms that produce TTX in newts. Revealing the presence of TTX-producing bacteria in newts would be highly interesting, as it would indicate that symbiotic microorganisms play a critical role in the well-studied newt-snake arms race.

ACTIVATION OF SEROTONERGIC NEURONS IN THE DORSAL RAPHE OF POSTPARTUM RATS FOLLOWING MATERNAL INTERACTIONS WITH PUPS AND EXPOSURE TO MILD STRESSORS

Janelle Miranda
Home Institution: University of Puerto Rico at Rio Piedras
Category: Integrative Biology, Section 2
Poster: 219
Time: 3:15 PM - 5:00 PM
Mentor(s): Mary Holschbach (Neuroscience), Joseph Lonstein (Psychology)

Infant contact reduces anxiety for postpartum mothers, but the neural mechanisms underlying this effect are mostly unknown. The dorsal raphe (DR), the main source of the brain's serotonin, may play a role because the DR is more active in parental animals and serotonin is related to anxiety. Here, we examined how offspring contact and stressors interact to activate serotonergic neurons in the DR of postpartum female rats. We used a 2x3 design to test effects of pup contact (pups in homecage vs. pups removed) and stressors (none, handling, or elevated plus maze) on colocalization of the cell activity marker, c-fos, and serotonin in the DR. Because subregions of the DR have unique function and physiology, and effects of pups and stressors may also be subregion specific, we analyzed the dorsal (DRd), ventral (DRv) and lateral wings

(DRlw) separately. We predict that pups will increase activation of serotonergic neurons, as indicated by dual labeled cells, in the DRd and DRv but not the DRlw and that stressors will activate more serotonergic neurons in the DRlw than in the DRd or DRv. Further, we hypothesize that exposure to stressors may activate more serotonergic neurons in the DRlw of dams with recent pup contact than those whose pups were removed and that the number of dual-labeled neurons in the DRlw will be negatively correlated with anxiety-like behaviors. This experiment will help demonstrate possible neural mechanisms underlying the role of infant contact in anxiety of new mothers.

MECHANICAL ENGINEERING

BIOMECHANICAL COMPARISON OF SHORT VERSUS LONG CEPHALOMEDULLARY DEVICES FOR OTA 31-A-2 PROXIMAL FEMUR FRACTURES

Brooke Peruski
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 225
Time: 1:00 PM - 2:45 PM
Mentor(s): Seungik Baek (Mechanical Engineering)

There is a need for biomechanical understanding and strong clinical data that supports the superiority of short versus long cephalomedullary nails for OTA 31-A-2 fractures of the proximal femur. Currently the decision is left to the surgeon to decide on the use of long or short nails during surgery. It is known that long nails require more surgery time, cost more, and result in additional blood loss compared to short nails. The objective of this study is to better understand the differences between long and short cephalomedullary nails in regards to axial and rotational stiffness as well as looking at how variations in stability of fractures effect how well the nails stabilize them. Finite element analysis, based on CT scans, is utilized to simulate proximal femur fractures treated with short and long nails subjected to various load configurations. In addition to the FEA model, experimental testing is conducted to verify the results. Thirty synthetic, medium foam cortical shell femoral sawbones are split into two groups of fifteen. One group receives long nails while the other group receives short nails. Within these groups three sub-groups are created. Each sub-group corresponds to variation in stability of the fracture. The stabilities ranged from cut sections from 5mm to 15mm. The sawbones are tested using an MTS machine to simulate various activities. Fracture regions and strength of the bones with nails implanted were collected and analyzed to help verify the use of short and long cephalomedullary nails for OTA 31-A-2 fractures of the proximal femur.

THE EFFECT OF AGE ON PEDIATRIC SKULL FRACTURES

Sean Hand
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 226
Time: 1:00 PM - 2:45 PM
Mentor(s): Roger Haut (Mechanical Engineering)

Head trauma is a leading cause of death in infants and fracture patterns of the skull are often used to determine whether the injury is due to abuse or an accident. The goal of this study is to observe the effects of age on skull fractures resulting from blunt trauma. Previous research has shown that infant porcine heads are a suitable substitute for human infant heads because their mechanical properties scale in a known way. This experiment is a continuation of previous work in the lab; but in the current study, impact energy will be constant across varying ages of porcine skulls. A custom drop tower is being used to impact the heads with a consistent, controlled orientation so that the right parietal bone on the skull will strike a rigid interface. The drop tower will allow porcine heads to accurately free fall from pre-determined heights to impose constant levels of impact energy. After trauma, fracture lengths and locations will be documented. To date, the study has shown that there is less cranial fracturing as age increases. This is likely due to a thickening and stiffening of the pig skull with age.

VISUAL REPRESENTATION WITH 3-DIMENSIONAL MODELING OF ABDOMINAL AORTIC ANEURYSM

Saul Makanga
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 227
Time: 1:00 PM - 2:45 PM
Mentor(s): Seungik Baek (Mechanical Engineering)

The cardiovascular system primarily functions as a circulation of branches that transport nutrients throughout the body. The heart periodically injects blood through multiple blood vessels in which blood is distributed to different tissues and organs. As for arteries, they mainly adapt to the flow and pressure in which they either enlarge or shrink depending on physiologic conditions. In many cases, the study of cardiovascular system is associated with the form of abnormal blood flow in arteries.

There are many different diseases associated with the abnormal flow in arteries; one of them is called the abdominal aortic aneurysm. An abdominal aortic aneurysm is a dilatation of the abdominal aorta exceeding beyond the normal maximal diameter, thus resulting in expansion or rupture of the aorta. Since the aorta is the main supplier of blood to the body, an expansion or rupture can cause severe and life-threatening internal bleeding. The study of progression of aneurysms has become a key aspect in an effort to predict how or when aneurysms may occur. To accurately study these events requires an integrated tool of visualization such as a computational fluid dynamics simulator. A computation fluid dynamics simulator simply shows a graphical visualization of blood flow in the aneurysm and the engineering helps to aid clinical treatments and designs of surgical procedure. A visual representation of the abnormal blood flow can be the major factor on providing physicians and patients a better understanding of the aneurysm behavior.

ASSESSING THE FINANCIAL FEASIBILITY OF LIGHTING RETROFITS ON CAMPUS

Erik Miller-Galow
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 228
Time: 1:00 PM - 2:45 PM
Mentor(s): Andre Benard (Mechanical Engineering), Andrew Grossman (Mechanical Engineering)

Targeting the lighting system of a building for upgrades may offer substantial energy and economical savings. Light emitting diodes (LED) are 30% more efficient and last 40,000 hours longer than current prevalent fluorescent lighting systems. Furthermore, occupancy sensors reduce the energy used for lighting by approximately 25%. In this project, an innovative lighting system retrofit financial feasibility software solution is being developed for energy planners working on a limited budget. The software is based on MATLAB and Excel, and requires a series of 'walkthroughs' of the building under analysis to record various conditions of the current lighting system. The design of the software is flexible enough to meet the uniqueness of each building as well as provide a user-friendly environment. After the initial 6 month phase of data-gathering has been completed, the program will require various financial parameters, such as the commodity rate of electricity and U.S. inflation rates, for example. After all required information is entered, the user will be presented with the results of the analysis. Included outputs will encompass total annual cost of the current lighting system, annual costs of alternatives such as LED lighting and occupancy sensors, along with a complete retrofit financial feasibility analysis. The structure of the software will allow the user to view customizable sets of data to their liking. Through a multitude of comparative data based on the current lighting infrastructure, the program will reveal to the University where to target a lighting retrofit.

FINANCIAL FEASIBILITY STUDY FOR RETROFITTING FARRALL HALL'S HVAC SYSTEM WITH A GROUND SOURCE HEAT PUMP

Joe Weber
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 229
Time: 1:00 PM - 2:45 PM
Mentor(s): Andre Benard (Mechanical Engineering), Andrew Grossman (Mechanical Engineering)

The heating, ventilation, and air conditioning (HVAC) system in a commercial building accounts for 40% of the total energy consumption. Consequently, substantial energy and financial savings may result from targeting the HVAC for a retrofit. A ground source heat pump (GSHP) utilizes the ground around the building as a heat sink in the summer and a heat source in the winter. An HVAC system paired with a GSHP leads to a 60% increase in efficiency, along with a greater life expectancy and less of a need for maintenance overall. This project deals with the design and financial feasibility assessment of such a system for Farrall Hall. The parking lot North of Farrall Hall, Lot 41, is scheduled to be converted into 'green space', making this an ideal location for the bore field of the GSHP. The analysis tools being utilized are Trane Trace 700 and Ground Loop Design (GLD). Trace 700 requires building inputs such as the building envelope and ventilation requirements as specified by ASHRAE 62.1 and 90.1, such that heating and cooling loads may be determined. GLD then uses the heating and cooling loads from Trace 700 to size and design the bore field necessary for the GSHP. Following, the values from GLD are imported back into Trace 700 so the HVAC system for the building may be designed. Both of these tools perform a simple economic and GHG analysis of HVAC system.

STRUCTURAL JOINING OF DISSIMILAR MATERIALS: BONDED PI/T-JOINTS

Jack Potterack
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 230
Time: 1:00 PM - 2:45 PM
Mentor(s): Mahmoodul Haq (Composite Vehicle Research Center)

Adhesively bonded structures have the potential for reduced structural weight without sacrificing mechanical performance

and cost. Multi-material joining using bonding techniques has gained recent interest, but a lack of comparable data creates a need for considerable understanding of various parameters. In this work, out-of-plane Pi/T-joints, consisting of a combination of adherends including glass fiber reinforced composite (GFRP), advanced high strength steel (AHSS), and aluminum (AL), were manufactured using FM-94K adhesives. The out-of-plane behavior was evaluated by web pull-out tests, and the resulting performance of the Pi/T-joints was compared with existing results on 'all-composite' joints. Efficient manufacturing and experimental testing is currently in progress and will be reported in upcoming communications. Overall, results show potential in adhesively bonded techniques for structural joining of dissimilar materials. Nevertheless, statistically significant tests need to be performed to fully understand the behavior of these components and structures to implement them into possible vehicle applications.

NOVEL, TAILORABLE, HYBRID FASTENING SYSTEM

Jacob Ripberger
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 1
Poster: 231
Time: 1:00 PM - 2:45 PM
Mentor(s): Gary Cloud (Mechanical Engineering), Mahmood Haq (Mechanical Engineering)

Structural joining of materials and components involves complex phenomena and interactions between several elements of either similar or dissimilar materials. A novel joining technique (patent pending) that overcomes the limitations of conventional joining methods and incorporates the advantages of both bonded (lightweight) and bolted (easy disassembly) techniques is studied. The most basic configuration of this invention consists of a bolt that has a channel machined through the bolt-shaft that allows injection of an insert compound that fills the hole-clearance of the work-pieces and acts a structural component. The hole may contain additional sleeves or inserts. In this work, glass-fiber reinforced composite plates were used as adherents with 12.5 mm holes, grade 8 bolts and preloaded to a torque of 35 ft-lb. SC-15 and unsaturated polyester resins reinforced with varying concentrations of clay nanoplatelets fill the hole-clearance containing carbon and glass biaxial sleeves. Tension lap-shear tests were performed on conventional and novel hybrid joints and their performances were compared. Preliminary results reveal that hybrid joints can eliminate joint slip and considerably delay the onset of delamination. The proposed joining technique is highly tailorable and holds great promise for wide range of applications.

HYBRID CONDENSING GAS WATER HEATER

Alexander Schuen
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 2
Poster: 232
Time: 1:00 PM - 2:45 PM
Mentor(s): Elisa Toulson (Mechanical Engineering)

By 2015, new standards for the efficiency of water heaters will be put into effect, and many companies are researching methods of improving water heater design to accommodate this change. One design being considered for the new efficiency standards is a gas-fired hybrid instantaneous/storage tank water heater using type 439 stainless steel for the reservoir and heat exchanger. This stainless steel alloy offers more resistance than the copper to the corrosion of the acidic condensation that occurs due to the higher efficiency-operating mode. This alloy has never been used in the water heater industry, and has not been tested against the various contaminants that can be found in potable water sources throughout the country. The purpose of this study will be to determine which contaminants will cause problems with the alloy, and over what period of time. In order to accomplish this, data on the most abundant contaminants found in potable water sources throughout the country will be examined. This data will be used to create water mixtures using the maximum observed contaminant concentrations, the mixtures will then be tested in an apparatus designed to simulate the water heater. The apparatus will enable the effects of the contaminants on the 439 stainless steel and potentially other materials to be determined. The results of the testing will determine which types of stainless steels will withstand the effects of the corrosive components in water and enable water heater manufacturers to determine appropriate materials that will be both durable and cost effective.

CREATING FUEL CELLS FROM POWDER

Gabriel Talon
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 2
Poster: 233
Time: 1:00 PM - 2:45 PM
Mentor(s): Patrick Kwon (Mechanical Engineering)

The purpose of this research is to strengthen a fuel cell for multifunctionality by developing novel processing techniques with ceramic powders. Once it has been tested to be strong enough, they can be used as a part of the structural element on a

vehicle. As of now, alternative energy cars cannot travel vary far due to their ratio between power output and vehicle weight. If the fuel cells can be used as a structural element, then they are multipurpose rather than just taking up room and adding unnecessary weight. The way we consolidate the fuel cells from powder is by layering the layers of powder then adding spherical graphite particles not only to create the porosity essential for fuel cell function, but also to induce the porosity least detrimental to structural integrity and additional micro and nano powders to change the shrinkage behavior so that multiple materials in mutilayers can be co-pressed and co-sintered.

EXPLORATION OF A ROBOT SYSTEM FOR BRAIDING QUADRI-AXIAL FABRIC

Zhanying Hu
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 2
Poster: 234
Time: 1:00 PM - 2:45 PM
Mentor(s): Guojing Li (Mechanical Engineering), Dahsin Liu (Mechanical Engineering)

This research project is aimed at building a simple robot system to construct a quadri-axial woven fabric based on glass fiber yarns. The basic approach is to use four robots guided by LED lights. A minimum of 500 LEDs are arranged in a square array to form a platform for robots to operate. The project requires knowledge concerning robots, computer programming and mechanical joining techniques. Many options on robot and LED designs were obtained from the internet. The selection, purchasing, construction and operation of the robots and LEDs were then followed. A one-robot system was successfully designed and completed. It is the objective of this study to build a robot system in which four robots are able to follow the guidance of the LED lights, to carry fiber yarns over one another, and to form a four-directional woven fabrics without colliding with each other.

PERMEABILITY CHARACTERIZATION OF GLASS AND CARBON FABRIC PREFORMS FOR MODELING RESIN TRANSFER MOLDING

Stephen Sommerlot
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 2
Poster: 235
Time: 1:00 PM - 2:45 PM
Mentor(s): Alfred Loos (Mechanical Engineering)

Characterizing preform permeability of fabric reinforcements for composite materials is an essential component for process modeling of thermoset matrix composites. This study investigates steady-state in-plane and through-thickness permeability for glass and carbon fiber fabrics for modeling purposes. Principal permeabilities are also explored in the in-plane direction by taking off-axis permeability measurements and transforming the resulting in-plane permeability tensor. An experimental setup for a resin transfer molding (RTM) validation experiment is presented and a MATLAB based RTM mold filling analysis program is offered as a simplified simulation method. Experimental results are compared to MATLAB predictions based on measured permeability values, and the validity of simulation tool is weighed. Future considerations include a more robust model and flow front monitoring technique for permeability verification.

REAL-TIME IMAGE PROCESSING FOR FLUID FLOW STUDIES

Hokchhay Tann
Home Institution: Trinity College
Category: Mechanical Engineering, Section 2
Poster: 236
Time: 1:00 PM - 2:45 PM
Mentor(s): Manoochehr Koochesfahani (Mechanical Engineeering), David Olson (Mechanical Engineeering)

Molecular Tagging Velocimetry (MTV) is a whole field optical technique that relies on molecules that can be turned into long lifetime tracers upon excitation by photons of appropriate wavelengths. Typically, a pulsed laser is used to “tag” the regions of interest, and those tagged regions are interrogated (photographed) at two successive times within the lifetime of the tracer. The measured Lagrangian displacement vector, determined by image cross correlation, provides an estimate of the velocity vectors, from which vorticity may be estimated. This computationally expensive image processing technique is one constraint in using MTV for real-time measurements. The current implementation is serial in nature, but is well-posed for highly parallel implementations. This study aims to develop a parallel implementation of the technique. Additionally, higher order image processing techniques will be developed to allow the direct computation of vorticity from the same data set.

GREEN COMPOSITES FROM COTTON-GIN WASTE FOR STRUCTURAL APPLICATIONS

Stephanie Fierens
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 2
Poster: 237
Time: 1:00 PM - 2:45 PM
Mentor(s): Leonardo da Costa Sousa (Chemical Engineering and Material Science), Mahmood Haq (Civil and Environmental Engineering), Balan Venkatesh (Chemical Engineering and Material Science)

Increasing environmental concerns such as biodegradability, recycling issues and dependability on non-renewable petroleum reserves have propelled the development of alternatives for conventional composites made from synthetic fibers and petroleum resins. Bio-composites are composed of natural fibers [bast fibers (jute, flax, hemp, ramie and kenaf), leaf fibers (abaca, sisal and pineapple), seed fibers (coir, cotton and kapok), core fibers (kenaf, hemp and jute), grass and reed fibers (wheat, corn and rice) and all other types (wood and roots)] in synthetic or natural polymer matrices that have gained much attention due to their low cost, environmental friendliness, and potential to compete with synthetic composites in terms of cost and properties. Cotton-gin waste (seed fiber), a by-product of the cotton industry, is a renewable resource that is plentiful in the US. Alternative uses for such eco-friendly bio-composite materials, including possible structural applications, are explored in this work. Biocomposite plates with hemp and cotton gin (~30% by wt.) were mixed with unsaturated polyester resin (UPE) and manufactured through compression molding. Comparisons were made between bio-composites and were prepared using AFEX (ammonia fiber expansion) surface treated fibers and untreated fibers. Also two concentrations (2.5% wt. and 5.0% wt.) of nano-clay (Cloisite30B) were reinforced with polyester resins using sonication. Tensile properties of the resulting biocomposites were studied and compared with baseline UPE/hemp plates. Preliminary results show bio-composites that were prepared using cotton-gin waste had excellent tensile strength when compared to bio-composites made using hemp and have potential to be used for structural applications. Details about these findings will be reported.

FATIGUE AND DEGRADATION TESTING OF COMPOSITE MATERIALS FOR THE CONSTRUCTION OF FATIGUE MODEL

Garrett Dunn & Chelsea Colby
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 3
Poster: 238
Time: 3:15 PM - 5:00 PM
Mentor(s): Xinran Xiao (Mechanical Engineering)

Composite materials are a growing interest in the modern engineering industry. They offer the same strength of many metals but at a fraction of the weight, which make composite materials extremely viable for land, air, and sea vessels. However, because these materials are relatively new, little is known about their long term behaviors. In order to accurately predict how these materials will perform, large amounts of testing must be conducted to create accurate and usable data. This experiment includes testing the fatigue life and degradation of composite materials under shear forces. Fatigue life testing consists of exerting a specimen to a fraction of its maximum allowed load at a number of loading cycles until it reaches failure. A basic example of a fatigue life test is bending a pop can tab back and forth until it breaks. The degradation testing performs a desired number of fatigue cycles without failure and then completes a tensile test on the specimen. This test type shows how strength and stiffness of the material can change after many fatigue cycles. By populating graphs with these types of testing data, composite material researchers can create an algorithm to accurately predict the future behavior and failure of composite materials.

MODELING FORCES OF THE INDEX FINGER OVER RANGE OF MOTION

Joshua Drost
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 3
Poster: 239
Time: 3:15 PM - 5:00 PM
Mentor(s): Tamara Bush (Mechanical Engineering)

The current method of measuring hand function in people with arthritis, hand rehabilitation and nerve damage is task-based and subjective. Recently, work has been conducted to model the motion of the hand in order to better measure hand function. However, such models focus on the kinematics of the hand and not the forces that can be applied. This study seeks to measure and model the maximum forces that the index finger can apply over the range of motion. Force generation of the index finger was gathered in 13 finger postures. Each subject was asked to apply maximum force with the index finger on a multi-axis load cell to determine both magnitudes and directions of forces. The finger posture was also captured in each position with a motion capture system. These forces were then fit to a three-dimensional model to locate the forces in kinematic space. Next, these data were used to approximate the maximum forces over the entire range of finger motion. Adding forces to the kinematic model will be able to assist in monitoring rehabilitation progress and treating patients with reduced hand function.

PREDICTING THE FREE TORQUE ON VARIOUS ATHLETIC SURFACES USING SUBJECT AND SHOE SPECIFIC MODELS

Benjamin Carruthers
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 3
Poster: 240
Time: 3:15 PM - 5:00 PM
Mentor(s): Roger Haut (Radiology and Osteopathic Medicine), Brian Weaver (Mechanical Engineering)

Excessive torque generated at the shoe-surface interface has been shown to increase the risk of injury to ligaments of the ankle and knee. How different levels of torque from various turf surfaces relate to the potential for injury is unknown. Recent studies from this laboratory have illustrated the feasibility of using insole pressure sensor technology to predict the free torque generated by a subject wearing a specific shoe. This methodology, in conjunction with motion capture, could enable the determination of joint loads and ligament strains that are produced as a function of the torque generated at a shoe-surface interface. The goal of this study was to validate this methodology for its use across different surfaces. Plantar pressure, motion, and force plate data were collected from participants fitted with a cleated athletic shoe on multiple surfaces fixed to a force plate. Pressure Sensor Masks (PSM) were formed by using data from specific spatially-located pressure sensors that were highly correlated with the measured free torque ($R > 0.80$). Linear regression analyses were utilized to develop Subject and Surface Specific models from the PSMs. Although previous research has indicated that a subject and shoe specific model is required for accurate predictions, the results of the current study indicate that a subject and shoe specific model can accurately predict the free torque generated across multiple surfaces. This technique could potentially allow the use of laboratory generated subject and shoe specific models on actual athletic field surfaces outside the laboratory to investigate the potential for injury.

EFFECTS OF OSTEOPATHIC MANIPULATIVE THERAPY ON NEUROMUSCULAR CONTROL OF THE HEAD-NECK SYSTEM

Christopher Ramsey
Home Institution: Grambling State University
Category: Mechanical Engineering, Section 3
Poster: 241
Time: 3:15 PM - 5:00 PM
Mentor(s): Jongeun Choi (Mechanical Engineering)

Neck pain is a major musculoskeletal complaint affecting 70% of individuals at some point during their lives. One treatment that has been effective in relieving musculoskeletal pain in the head-neck area is osteopathic manipulative therapy. However, in most studies, the methods used to support these findings have been limited to the test of the physical range of the therapists and statements coming from the patients. Therefore, these research efforts are not sufficient to accurately determine the effectiveness of this therapy, characterize its mechanisms, or optimize treatment. The goal of this proposed project is to improve sensitive and objective clinical tools for the assessment of the head-neck motor-control system. One objective of the study is to apply these tools to measure changes in position and force control of the head-neck system in patients with neck pain following osteopathic manipulative treatment. The second objective is to assess differences in position and force control of the head-neck system between patients with neck pain and healthy individuals. One variable we will need to be able to find is the center of mass of an individual from their trunk to their head. In order to do this we are planning to find the center of mass and moment of inertia to give us the most accurate measures.

BIOMECHANICAL PROPERTIES OF VARIOUS FOOTWEAR

Katie Landwehr
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 3
Poster: 242
Time: 3:15 PM - 5:00 PM
Mentor(s): Jerrod Braman (Radiology Osteopathic Medicine), Roger Haut (Radiology Osteopathic Medicine)

Footwear has evolved from being ornamental to functional for specific customers for each shoe. The purpose of this study was to establish a set of baseline footwear characteristics and to compare the results across a variety of footwear types identified by the manufacturer. These included minimalist shoes, work boots with protective toe coverings, hiking boots, and casual shoes. Measurements, mechanical and human participant tests were conducted on five different pairs of footwear provided by Wolverine World Wide, Inc. (Rockford, MI). Mechanical characteristics such as stiffness and cushioning properties were established through flexion testing at the toe, torsional flexibility, heel and toe impacts, compression tests, and thermal upper property tests. The interaction between footwear and the human participants was evaluated using a force plate to obtain rate of heel loading, plantar pressure measurement insoles for pressure distributions, and electromyography sensors for muscle activity level while standing, walking and running. Data from the tests were compiled and associations between footwear design and biomechanical data were noted for each shoe and between shoe types. Comparisons were also made between the results of mechanical testing and the data from participant tests with the shoes.

To date, correlations have been established between rotational flexibility of the footwear and muscle activity while walking in boots, as well as high stiffness in the heel resulting in an increased rate of loading during walking.

METHODS FOR PROCESSING POROUS HYDROXYAPATITE SAMPLES

Logan Springgate
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 4
Poster: 243
Time: 3:15 PM - 5:00 PM
Mentor(s): Patrick Kwon (Mechanical Engineering)

An average hip replacement requires a second replacement within 15 years due to loosening of the prosthetic. This loosening is caused by the large strength difference between materials used in prosthetic hips, such as titanium, and natural bone which, in turn, causes a reduction of bone around the prosthetic, or stress shielding. Hydroxyapatite is an ideal material because of its biocompatibility; however there is still a large difference in strength between natural bone and hydroxyapatite. Increasing the porosity of a sample reduces the strength and could allow for a material that is ideal for use in prosthetics and bone implants in the future. This study processed samples with varying porosities by partial sintering and full sintering with a phase that burns out during sintering.

DETERMINING SAFE MOTION LIMITS FOR HUMAN SUBJECT/HEXAPOD ROBOT INTERACTION

Justin Rucinski
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 4
Poster: 244
Time: 3:15 PM - 5:00 PM
Mentor(s): Clark Radcliffe (Mechanical Engineering), Peter Reeves (Osteopathic Surgical Specialties)

This project focuses on developing a method to set safety limits on a safety system designed to monitor the motion of a Mikrolar 6 degree-of-freedom hexapod robot. Effective and safe limits are important in order to ensure the human subjects sitting on the robot will not suffer any injuries should the robot move in an unpredictable and unsafe manner. Analytical motion values were generated from a list of trajectory angles which control the robot's movement compared to motion values obtained from the sensors in the safety system. The values were then analyzed and safety limits were determined based on the results. The methods used to obtain the safety limits may be found to be applicable to other motion measurement systems.

DESIGN AND FABRICATION OF A WAVE-GENERATING MACHINE.

Cody Thon
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 4
Poster: 245
Time: 3:15 PM - 5:00 PM
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

This research will help to bring the waves of small or large bodies of water to a testing pool to further the understanding of how aquatic robots react to rough wave conditions. One way to create waves in a testing pool is to construct multiple panels vertically across one end of the pool to push against the water and create waves. An electric motor supplies the power and periodic motion to the panels. The panels can be mechanically set out of phase from each other to create a suitable wave for any scenario. Another way to create waves is using a large bobbing device. A bobbing device consists of an object with a large surface area that is repeatedly forced up and down into the water. This bobbing device also utilizes an electric motor to supply the power and periodic motion. To minimize the reflection of the waves off of the opposite end of the testing pool, a wave diffusion device is utilized. This device cancels out the waves before they can reflect back and cause unwanted wave patterns in the testing tank. When complete this wave-generating machine will allow for a better understanding of robot operation in rough wave conditions.

FATIGUE LOADING OF COMPOSITE MATERIALS

Gabrielle Colby
Home Institution: Michigan State University
Category: Mechanical Engineering, Section 4
Poster: 246
Time: 3:15 PM - 5:00 PM
Mentor(s): Xinran Xiao (Mechanical Engineering)

Fatigue loading as well as degradation testing done on composite materials.

DESIGN, FABRICATION, AND ANALYSIS OF A PASSIVE JOINT FOR FLEXIBLE PECTORAL FINS ON A ROBOTIC FISH

Victoria Kane
Home Institution: Clemson University
Category: Mechanical Engineering, Section 4
Poster: 247
Time: 3:15 PM - 5:00 PM
Mentor(s): Xiaobo Tan (Electrical Engineering)

This paper presents the modeling, design, and fabrication of a passive joint for a robotic fish with flexible pectoral fins with the intention of making the fish "free-swimming." Engineers and biologists have examined robotic fish in order to monitor water quality as well as to study real fish behavior but a "free-swimming" fish has yet to be created. The passive joint is attached to a servomotor that is placed on the side of the 3D-printed fish body, which controls the pectoral fin and thus forces the fins to stroke back and forth. The pectoral fin's position is controlled by the passive joint without the motor's control and is designed to reciprocate the nature of real fish fin. This reciprocal nature requires rotation of the pectoral fin at the end of each stroke. When the paddle-shaped pectoral fin rows towards the back of the fish, the fin becomes perpendicular to the fish and water surface, consequently causing forward propulsion. However, when the pectoral fin moves back to the original position, the passive joint causes the pectoral fin to move parallel with the fish as a means of decreasing drag. The proposed model of the joint is validated with experiments done on the robotic fish to determine whether the hypothesis was determined to be true by testing a distance of six feet, which is the size of the tank, and the time in which this movement takes in order to conclude the fishes forward velocity.

PHYSICAL & MATHEMATICAL SCIENCES

COMMISSIONING OF THE BECOLA FACILITY AT NSCL: COLLINEAR LASER SPECTROSCOPY USING A BUNCHED K-39 BEAM

Ryan Strum
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 250
Time: 3:15 PM - 5:00 PM
Mentor(s): Kei Minamisono (Physics)

The BEam COoler and LAser Spectroscopy (BECOLA) facility was constructed and commissioned at the National Superconducting Cyclotron Laboratory (NSCL) to study fundamental properties of atomic nuclei including the nuclear spin, magnetic dipole moment, electric quadrupole moment and mean-square charge radius. A low-energy (29.7 keV) continuous ion beam of stable 39K produced from an off-line ion source was cooled and bunched, and the resulting pulsed beam of 39K ions was neutralized in a charge exchange cell with a sodium vapor. Laser light from a continuous-wave Ti:Sapphire laser was collinearly propagated with the neutral, pulsed 39K beam and resonant fluorescence was detected by a photomultiplier tube as a function of the laser frequency experienced by the moving atoms. The resulting hyperfine spectrum was analyzed in terms of signal-to-noise ratio to quantify the overall sensitivity for fluorescent light collection. As a means of enhancing signal-to-noise, a laser power controller was placed in the laser light path immediately upstream of the optical window used to introduce the laser light into the collinear beam line. The results of the signal-to-noise measurements, as well as an overview of the BECOLA facility, will be presented.

PARALLELIZATION OF A KINETIC SUPERNOVA SIMULATION

James Howell
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 251
Time: 3:15 PM - 5:00 PM
Mentor(s): Dirk Colbry (Institute for Cyber-Enabled Research)

Modeling hydrodynamic shock wave simulations using the kinetic interactions of millions of particles is too computationally demanding to be processed in serial. This research focuses on optimizing the parallel performance of a kinetic Monte Carlo supernova simulation. We hope to attain a flexible program that scales well with the architecture of modern supercomputers, such as the Stampede supercomputer at the Texas Advanced Computing Center, taking advantage of the latest Intel Xeon Phi coprocessor. This approach requires a hybrid model of programming that combines a message passing interface (MPI) with a multithreading model (OpenMP) in C++. Our preliminary results show that significant gains in performance can be made by using more processors.

OPTIMIZATING THE EFFICIENCY OF ION PRODUCTION THROUGH SIMION

Jeremy Ariche
Home Institution: Morehouse College
Category: Physical and Mathematical Sciences, Section 1
Poster: 252
Time: 3:15 PM - 5:00 PM
Mentor(s): Scott Bustabad (National Superconducting Cyclotron Laboratory), Ryan Ringle (National Superconducting Cyclotron Laboratory)

One essential feature of the Low Energy Beam and Ion Trap (LEBIT) Facility is the laser ablation site. Comprised mainly of an extraction system, three electrostatic quadruple deflectors that aid in guiding the ions, and an ion target, its purpose is to optimize the number of ions traveling along the beam line. To achieve maximum optimization, various parts of the contraption must be altered via system tuning. Proper procedures in system tuning normally involve changing the voltage or re-adjusting the equipment accordingly. Parameters must be monitored and altered accordingly in order for ions to behave in a desired manner. Within the past few years, changes have been made to the location of the gate valve which resulted in a change in distance between the position of the extraction system and quadruple deflectors. This in turn will negatively affect the total efficiency of the ion beam source passing into the line. Specifically, not all ions pass through the extraction system to allow for the most precise results. In order to resolve this problem, a simulation program, called SIMION, is used to simulate ion production. By using the SIMION program to model the actual process, we aim to reconfigure the voltages within beam source to allow all ions to enter the beam line for total acceptance into the cooler buncher.

ALTERING DIOPHANTINE TRIPLES

Ogochukwu Nwabuokei & Samad Trice
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 253
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Statistics and Probability)

We are taking the original Diophantine triples Equation by Diophantus of Alexandria and altering them. Diophantine Triples are a set of three numbers ((a,b,c)), that the product of any two of these numbers increased by one produces a perfect square. The basis of our research is altering the original formula by changing the constant from positive one to negative one. As well as figuring out if the starting number for the sets of triples has to start with a 1 or if can be another number entirely. We used a computer software named "python" to compute more triples efficiently to assist us with our research. After computing the triples with "python" we then identified the pattern among the sets of triples and then created sets of equations to define the pattern.

ANALYZING FRACTALS AND SPACE FILLING CURVES THROUGH THE BUILDING PROCESS OF A STRUCTURE

Quintin Shine & Jada Leslie
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 254
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Statics and Probability)

Throughout history, fractals and space filling curves have been used to some degree to relate a mathematical principle to real world applications. This research will take the fractal and space filling curve a step further by relating the geometric construct of a building to both. The research will also suggest a new a creation of a space filling curve similar to the Vicsek fractal.

COMPUTATIONS FOR STATISTICAL LINEAR DISCRIMINANT ANALYSIS

Andres Cubas
Home Institution: Florida International University
Category: Physical and Mathematical Sciences, Section 1
Poster: 255
Time: 3:15 PM - 5:00 PM
Mentor(s): Louis Liu (Mathematics)

Linear Discriminant Analysis is a type of analysis used in multivariate statistics to predict the group identification of an object by observing certain qualities of a sample. This type of statistical analysis may be very useful in many fields of research that involve observing many different qualities of specimens and that are categorized in distinct groups. This study consists of investigating the difficulty of computing discriminant functions and searching for efficient computations of a discriminant function using the knowledge of mathematics.

APPLICATION OF POLYMETHYLHYDROSILOXANE REDUCTIONS OF TIN TO THE IN SITU PREPARATION OF STANNANES
Monique Noel
Home Institution: Florida Agricultural Mechanical University
Category: Physical and Mathematical Sciences, Section 1
Poster: 256
Time: 3:15 PM - 5:00 PM
Mentor(s): Robert Maleczka (Chemistry)

This study shows that a mixture of tri-n-butyltin fluoride (Bu3SnF, a hydride acceptor), polymethylhydrosiloxane (PMHS, a hydride donor), and a catalytic amount of a reaction initiator, tetrabutylammonium fluoride (TBAF), can serve as an in situ source of tri-n-butyltin hydride (Bu3SnH). The resulting Bu3SnH (a hydrostannate) added a hydride and stannyl atom across a carbon-carbon triple bond (an alkyne) in a radical-based reaction and yielded a mixture of E- and Z-carbon-carbon double bond stereoisomers. Various amounts of the radical initiator azobisisobutyronitrile (AIBN) were tested in the reaction to encourage the formation of the Z-hydrostannylate stereoisomer as the major product. This investigation also explored the one-pot reactivity of the presumed Bu3Sn-X by-product generated after a reaction between Bu3Sn(allyl) and several aldehyde compounds containing an alkyne group. After reductive allyl transfer to the aldehyde occurs, the tin waste product is recycled in the second step of the reaction for the hydrostannation of the alkyne group. In addition to PMHS, a boron Lewis acid, B(C6F5)3, is introduced to promote the hydrostannation through an as of yet unknown mechanism. It is presumed that Bu3SnH is made transiently from the tin by-product. The specific role of the boron Lewis acid in the reaction mechanism will be examined by assessing how it affects the hydrostannation of alkynes by Bu3SnH generated in situ in our model reaction with Bu3SnF and PMHS.

FRACTAL ANALYSIS IN CANCER RISK
Sheryl Miller
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 257
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Mathematics)

Cancer research is a very crucial part of the science world today being that cancer is a leading cause of death among many people. It is important to explore new and innovative ways to help fight cancer. Fractal dimension analysis is a new approach to assessing cancer risk, and with this we can learn better ways of treatment. First I explored the fractals and the fractal dimension, later relating it to assessing cancer risk in three different types of cancer. By doing this I found that fractal dimension analysis is a new, useful way to assess cancer risk and relapse potential.

THE GOLDEN RATIO: OBSERVED IN THE HUMAN BODY
Briana Byrd
Home Institution: Michigan State University
Category: Physical and Mathematical Sciences, Section 1
Poster: 258
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Lyman Briggs College, Statistics and Probability)

Leonardo Da Vinci believed that the human body was made of equal proportions, one of them being arm length: shoulder width equaled to the golden ratio, 1.61803398875. That is the bases for my research; using height and arm span, and finding the correlation between the two. Other proportions used were height, navel-feet, and arm span to compare to Da Vinci's theory. Finally, the mean proportion from each was put to a hypothesis test to determine significance of equaling the golden ratio or not.

SOCIAL, BEHAVIORAL, & ECONOMIC SCIENCES

THE SEGMENTATION OF SOCIAL EXPERIENCE
Wyatt Stahl
Home Institution: Grand Valley State University
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 260
Time: 1:00 PM - 2:45 PM
Mentor(s): Christopher Kurby (Grand Valley State University: Psychology)

Previous research has shown that people break up, or segment, the hierarchy of goals in human behavior into discrete

events. The current study expands this literature by investigating how people perceive events in a social context. We were also interested in how variables like grain size (large vs. small events) and type of personality may influence the segmentation of social events. Participants were asked to view short films of two people engaging in everyday activities. While watching the movies, they were asked to indicate the points when one activity ended and another began (i.e., segmenting the movies into events). After each film, the participants were asked to complete a recall task by typing the events that occurred in the film, and last, to complete a personality questionnaire. The movies were coded for changes in nonsocial and social actions of the actor. We found that changes in both social and nonsocial actions significantly predicted event segmentation behavior.

INTERNATIONAL RETAIL EXPANSION

David Bonema
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 261
Time: 1:00 PM - 2:45 PM
Mentor(s): Brenda Sternquist (Marketing)

Strategic international retail expansion extended model and positions (SIRE3) developed by Dr. Brenda Sternquist is a model made to analyze the reasons retailers go international. Within the model, there are two types of retailer companies: multinational and global retailers. Classification of retail companies helps to develop a more in-depth analysis of the ways in which retailer internationalization happens. The propositions of SIRE3 considers the why, what, where and how for multinational and global retailers. I am developing a database to test the propositions. When retailers have internationalized in the past, there have been success and failures of their internationalization. This model will take into consideration both successes and failures of retailers that have internationalized to develop a deeper understanding of the challenges that retailers face when going international.

SMALL FIRM EXPANSION IN NEWAYGO COUNTY, MICHIGAN

Samantha Padilla
Home Institution: St Mary's University
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 262
Time: 1:00 PM - 2:45 PM
Mentor(s): Dave Weatherspoon (Agricultural, Food and Resource Economics)

Firm expansion is a topic that has intrigued economists for decades. Expansion, used interchangeably with growth in this research, refers to a firm hiring more employees or increasing facilities. This paper uses a probit regression model to examine the main factors that influence the decision of small firms in Newaygo County, Michigan to expand their business. The probit regression model was selected because of the binomial variables in the data. Past research identifies entrepreneurial attitude, economic and policy factors, and availability of internal capital, as determinants that affect whether a firm will make the strategic decision to grow. This study is interested in determining if Newaygo County's businesses are influenced by the factors mentioned in the literature or if there are specific factors affecting firm decision making in Newaygo County. Politicians as well as economists have agreed that small businesses are an indispensable contributing factor to the growth of an economy. Nevertheless, there is not enough research regarding small business decision-making and the factors that affect the growth of a firm. This paper hopes to contribute to the study of small firms and more specifically, contribute to the understanding of the business environment and decision making in Newaygo County.

WHO DEFECTS? PARTY SWITCHING IN A NEW DEMOCRACY

Fritz Bondoa
Home Institution: University of Virginia
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 263
Time: 1:00 PM - 2:45 PM
Mentor(s): Jeffrey Conroy-Krutz (Political Science)

While party switching has been studied in Africa, many of the studies have focused on the effects of party switching on the political landscape. However, few studies have focused on who does the switching. We intend to fill this gap in the literature with the following research question: what types of people migrated from political party to political party in Senegal after the 2000 presidential election? We are using the 2000 presidential election as a benchmark because it marked the first loss for the Parti Socialiste, which had been in power since Senegal's independence in 1960. Following the 2000 presidential election loss, the Parti Socialiste also lost Parliament to Sopi, the new president's coalition, in the 2001 legislative election. The same pattern would continue to repeat itself in the next two election cycles: the party that won the presidency went on to win the legislature. Therefore we are interested in the frequency of switching after a presidential group wins reelection (changes between 2001 and 2007) and the frequency of switching after a presidential group loses (changes between 1998 and 2001,

and between 2007 and 2012). We argue that following a presidential election, politicians defected and switched to other parties, mainly the newly elected president's group. To determine the validity of our argument, we are looking at every candidate who ran for the 1998, 2001, 2007, and 2012 Parliamentary elections in Senegal. If our argument holds true, then the high frequency of defection can undermine the consolidation of a new democracy.

THE INFLUENCE OF SEX AND RACE ON DECISIONS ABOUT DANGER TOWARDS INGROUPS AND OUTGROUPS

Megan Covington
Home Institution: North Carolina Agricultural and Technical State University
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 264
Time: 1:00 PM - 2:45 PM
Mentor(s): Joseph Cesario (Psychology)

Previous research shows that racial bias may be a factor contributing to the rise in shootings of unarmed Black males in America. In recent studies, Correll et al., (2002) has identified "shooter bias" as the likelihood for individuals to shoot a target more quickly and more frequently when they are Black than when the target is White. This study will advance previous research by (1) studying responses of minority (Black, Hispanic, Asian) participants and (2) including other minorities and females as targets in a similar videogame shoot/ don't shoot task. Including additional races in the task as participants will allow me to test the perception of danger individuals have towards their own in-group and other out-groups.

THE IMPACT OF NATIONALITY AND SKIN-TONE ON LATINO APPLICANTS IN EMPLOYEE SELECTION

Carlos Moreno
Home Institution: University of Maryland - College Park
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 265
Time: 1:00 PM - 2:45 PM
Mentor(s): Ann Marie Ryan (Organizational Psychology)

This paper attempts to examine the effect of Latino applicants' ethnic identifiers (e.g. nationality) and race (e.g. skin tone) during the employee selection process. According to the multiple social categorization theory, cognitive processes activate or inhibit categories (e.g., skin tone or nationality) of individuals based on sensory cues. Previous research suggests that skin-tone cues may significantly impact an individual's perceptions of others. Hence, colorism is a prevalent issue that privileges light-skinned individuals over their dark-skinned counterparts. This form of stratification may lead to the adverse impact of various ethnic-Latino (e.g. Colombians or Dominicans) applicants during job selection. To understand these differences, there is a need to clarify the empirical vagueness concerning the conceptual definitions of race and ethnicity of Latinos to better understand its interactive influence on job candidates. The researchers hypothesized that there would be an interaction between skin tone and nationality such that darker skinned applicants from Dominican Republic will be evaluated lower than other applicants from Colombia. To examine the hypothesis, the researchers designed a 3 (Skin tone: Dark, Light, vs. None) X 3 (Nationality: Colombia, Dominican Republic, vs. None) between-subjects factorial design. Data will be collected using self-report measures via Amazon Mechanical Turk and Michigan State University HPR System. Results will be used to create interventions that can facilitate and enhance the objectivity of the job selection process. Gender was controlled for this study by focusing only on male candidates.

PERCEPTUAL ASSESSMENT OF INTELLIGIBILITY AND FLUENCY AS A FUNCTION OF PROSODIC CHARACTERISTICS

Kayla Tillman
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 1
Poster: 266
Time: 1:00 PM - 2:45 PM
Mentor(s): Laura Dilley (Communicative Sciences and Disorders)

Children's ability to effectively use prosody (e.g., pitch and timing) to convey information improves over developmental time. This research investigated effects of voice pitch on subjective judgments of aspects of the speech signal which are relevant to clinical assessment of speech-language disorders as well as developmental prosody research. Speech was subjected to modification in which fundamental frequency (i.e., the acoustic correlate of voice pitch) was lowered, raised, or held at its original level, for 5-year-old children's speech. The manipulations were expected to affect talkers' perceived ages, while leaving critical acoustic-prosodic correlates intact (e.g., fundamental frequency contour, speech rate). In an experiment, 40 listeners rated the modified speech regarding speech rate, fluency, and intelligibility. The data revealed the fundamental frequency manipulation significantly affected the perceived degree of fluency and intelligibility of speech, but not perceived speech rate. Results suggest that perception of the pitch of the voice is interdependent with perception of other aspects of the speech signal, a finding with implications for studying speech development.

COMPUTER AND INFORMATION SECURITY: EDUCATING THE USER

Kathryn Hoban
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 267
Time: 1:00 PM - 2:45 PM
Mentor(s): Rick Wash (Journalism)

Computer security experts want end users to behave securely. To help achieve this goal, they create education materials and make them freely available to the public. However, despite the abundance of these education materials, users are still struggling to behave securely. We want to know the topics and tactics security experts use to educate users. We approached this problem by collecting and analyzing computer security education materials from universities, companies, and government institutions. We collected documents from 26 organizations, including Microsoft, Stanford University, and the FBI, and then analyzed them for the topics they addressed as well as the approaches they took to educate users (e.g. scare tactics, step-by-step instruction, definition of terms). In the long run, we hope to compare these educational tactics to the way users actually learn about computer security. This poster will present an in-depth analysis of what experts want end users to know about computer security and how they convey this knowledge.

THE UNIQUE CHALLENGES IN DEVELOPING SOFTWARE FOR COLLECTING RESEARCH DATA

Nick Saxton
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 268
Time: 1:00 PM - 2:45 PM
Mentor(s): Emilee Rader (Telecom, Information Studies and Media), Kami Vaniea (Telecom, Information Studies and Media), Rick Wash (Journalism)

Developing software is never easy. It is even harder when that software is responsible for collecting data for a research project. Our research asks if users are being as secure on the internet as they think they are, so we developed a Mozilla Firefox extension to observe users' browsing habits to collect data to answer this question. Developing the software presented a unique set of challenges; building on Mozilla's platform and ensuring both data integrity and data usefulness. The first challenge was working with Mozilla's APIs which were not created with data collection software in mind. This meant testing not only our code but also testing Mozilla's often poorly documented functions to make sure that we were getting the data we wanted. The second challenge was keeping track of the context of a user's decisions. What web page a user is on when they enter a password or download a file heavily impacts how secure they are, but this is difficult to track due to the large number of actions a user could perform at any given time in Firefox. The third challenge was ensuring that the data our extension was capable of collecting could be used to answer our research question which led to a few major changes to the software in the later stages of development. This poster will take a look at these three challenges, how they affected the development process, and how they were overcome to finish the extension.

THE DIFFICULTIES OF TRACKING USERS' PASSWORDS

Raymond Heldt
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 269
Time: 1:00 PM - 2:45 PM
Mentor(s): Emilee Rader (Telecom, Information Studies & Media), Kami Vaniea (Telecom, Information Studies & Media), Rick Wash (Journalism)

Users often create passwords without following commonly-recommended standards, which can leave their account information vulnerable to getting accessed by an unauthorized party. Some passwords are quite common and typically among the first ones guessed by hackers. Some users have the same password across many different websites, so anyone who obtains their password on one site could access their accounts elsewhere. In this study, we are determining how to accurately track end-users' online behavior. We made an add-on for Mozilla Firefox and an extension for Google Chrome which collect information about users' browsing activity. One of the things we track is information about passwords entered and how well they follow commonly-recommended standards. Unfortunately, this type of tracking is not trivial. Users' privacy must be respected, so passwords themselves cannot be stored onto our server. We had to plan in advance what information about passwords (i.e. its strength, whether or not it is common, etc.) to immediately calculate once they get entered since no plaintext passwords would be available as a reference later on. However, some standards to check for require comparing passwords from different websites, so we store an encrypted version of each password on our server to allow for comparison later on. This poster will show the different mechanisms we use to track end-users' password behavior accurately while respecting both their privacy and security.

A SURVEY TO FIND WHICH MENTAL MODEL YOU FIT UNDER

Alexandra Hinck
Home Institution: Beloit College
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 270
Time: 1:00 PM - 2:45 PM
Mentor(s): Emilee Rader (Telecommunication, Information Studies and Media), Kami Vaniea (Telecommunication, Information Studies and Media), Rick Wash (Telecommunications, Information Studies and Media)

Every day, hackers and viruses attempt to break into home computers. In order to help people protect themselves from viruses and hackers, we must first understand how people think about computer security. Previous research has shown that different people have various ideas about computer safety, which result in different behaviors. Although many people believe that their actions are helpful, they may be wrong and fall victim to hackers and viruses. We call these different ways of thinking "mental models". We are creating a survey to better understand who fits under these mental models so that we can discover a more effective way to educate people on computer security. However, since many people do not think about viruses and hackers until asked, it is difficult to accurately measure what mental model people best fit under by filling out a questionnaire. The survey consists of attitudes, beliefs, and education participants have on the subject of computers. This survey will allow us to learn people's overall mental models and will show which approach may be most appropriate in teaching people about computer security. Other people who wish to research computer security in the future will also have access to use this survey to determine which mental model their participants fall under. Lastly, by using this survey, experts will be able to better understand computer users' thoughts on security precautions, risk management, and overall activity on computers.

DOES RELIGION AND EDUCATION BACKGROUND AFFECT STUDENT PERCEPTIONS OF EVOLUTION?

Lazarius Miller
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 271
Time: 1:00 PM - 2:45 PM
Mentor(s): Louise Mead (BEACON)

Evolution is the study of changes in the heritable traits of a population of organisms as successive generations replace one another. It would be beneficial to study evolution because the world and its inhabitants are always changing, where developments in new biological phenomena continue to emerge such as antibiotic resistance and inheritance of genetic diseases. The general attitude towards science careers in the United States is positive. However, many students in elementary through high school are not performing at higher levels of critical thinking. Research suggests high school students are not being sufficiently prepared to perform well in areas of critical thinking. Assessing if religious orientation is a dependent variable on educational perspectives will help determine a baseline for why some students are more receptive to evolutionary theories. This study will examine the relationships between student attitudes towards science and evolution as a function of religious beliefs and the access to supplemental education resources. This experiment will use surveys distributed to high school students enrolled in the BEACON Residential Summer Program. The survey entitled Evolutionary Concepts Questionnaire (ECQ) consists of three segments (demographics, education background, and an evolutionary survey) that will be used to evaluate any relationships between the factors of religion and evolution and educational background and evolution. The hypothesized results are that there will be a correlation between religion and evolution and educational background and evolution. These results may ultimately help science educators develop a method of teaching science more effectively and equitably.

DETERMINING THE ISSUES OF TRUST BETWEEN AFRICAN AMERICAN PATIENTS AND HEALTH CARE PROVIDERS THAT HAVE LEAD TO THE CREATION OF HEALTH DISPARITIES IN CARDIOVASCULAR DISEASE

Kidiocus Carroll
Home Institution: Beloit College
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 272
Time: 1:00 PM - 2:45 PM
Mentor(s): Clifford Broman (Sociology)

Why are African American patients less likely to receive appropriate cardiovascular care as opposed to non-minority patients? According to the research literature, African Americans account for the highest rates of mortality from heart disease. African Americans are less likely to receive appropriate cardiac medication or to undergo coronary artery bypass surgery. Racialized cardiovascular disparities are significant in the field of health and it is important to come to an understanding of how they have come into existence and the manner in which they operate in contemporary society. The objective of this research is to come to a conceptualization of how issues of trust between African Americans and their health care providers has led to racial disparities in cardiovascular disease. We propose that these disparities in health care are due

to a lack of trust between patient and health care provider, which can lead to a deficiency of health care provider recommendations to patients and a lack of patient compliance. This lack of mistrust can be attributed to a long and complicated history of mistreatment and discrimination on the part of health care providers towards African American patients and has manifested itself in the social consciousness of African Americans. An understanding of these issues could potentially lead to an idea of where cardiovascular disparities stem from, and could aid in the development of future methods of rectifying cardiovascular health disparities.

PROBABILITY MODEL FOR CHERRY PRODUCTION UNDER UNCERTAINTY

Matt Gammans
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 2
Poster: 273
Time: 1:00 PM - 2:45 PM
Mentor(s): J. Roy Black (Agricultural, Food, and Resource Economics)

Tart cherry farmers making land-use decisions face high degrees of uncertainty. This uncertainty is the result variation in weather and price, as well as the effectiveness of future technological improvements. This project seeks to provide a decision support model to tart cherry farmers making production decisions. We compare a current production system with a potential alternative, using triangle and cumulative probability distributions to account for uncertainty. Using the predictions of current industry members to assign distribution parameters, the net current values of both production systems were estimated. In the future, this method could be used to select the most profitable crop from multiple options.

EXHIBITING THE IMPACTS OF CONTINUOUS AND PERIODIC REPLENISHMENT

Archie Brown III
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 274
Time: 3:15 PM - 5:00 PM
Mentor(s): Claudia Rosales (Supply Chain Management), Matthew Anderson (Accounting)

Efficient hospitals require effective supply management among the many store rooms disbursed throughout the various departments found in a representative hospital. Optimal parameters are determined by the minimization of total cost, which consists of fixed costs, stock-out costs, and a time-weighted stock-out cost. For periodic replenishment, the objective is to evaluate the hospital's current conditions and calculate the most cost-effective length between cycles and demonstrate potential cost savings between current and optimized conditions. The objective for continuous replenishment is to compute the most effective quantity of empty primary bins before triggering a replenishment as well as calculating the optimized cost. To conduct this research, simulation was done in Python and Arena Simulation Software. This research was done to demonstrate the cost saving benefits of utilizing a continuous replenishment rather than periodic replenishment in hospitals practicing the two-bin inventory system. The goal of this research is to help alleviate cost incurred by store room replenishments while demonstrating the effectiveness of continuous replenishment over periodic replenishment.

THE CONNECTION OF PHYSICAL AND MENTAL HEALTH PROBLEMS TO UNEMPLOYMENT FOR WOMEN ON PROBATION AND PAROLE

Angela Kengara
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 275
Time: 3:15 PM - 5:00 PM
Mentor(s): Merry Morash (Criminal Justice)

Employment is assumed to be important in keeping women on probation or parole from re-offending and helping them pay their supervision fees as well as handling any other financial obligations. This presentation focuses on 402 Michigan women on probation and parole. Only 70 of them were employed full time, and only 57 of them had an annual income greater than $10,000. Although probation or parole stipulations typically require some form of employment, many women did not find a job or maintain steady employment. The present study examined qualitative data collected in interviews to determine whether women explained their lack of employment as a result of disability, substance abuse, mental health issues, medical illness, or pregnancy. These medical reasons were identified based on reading the transcripts for all 402 women. After one researcher created a codebook, 40 cases were coded by two researchers to establish acceptable intercoder reliability. These 40 cases are considered in the analysis. To further understand the women who indicated that they could not work due to medical reasons, they were compared to 40 employed women on measures of whether they were receiving welfare, had mental illness or substance abuse problems, had limited education, and age.

WHERE DO AMERICA'S BEST ATHLETES COME FROM?
Marcus Oden & Michelle Masarira
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 276
Time: 3:15 PM - 5:00 PM
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

States like Texas and Florida are known for the amount of football players they produce, while Indiana is a state that is known for its passion for basketball. With these reputations, it is assumed that these states produce a higher level of talent in certain sports compared to the general population, but do these representations hold any water? Or are they just formed because some states have more people, and therefore a better chance of producing more high-end athletes? We want to find out if it is really true that some states produce more high-end athletes than others. How many of a certain state's high school athletes turn into pro players? In other words, for every pro player from that state, how many high school athletes go through the system as well? There have been plenty of stories measuring how many National Basketball Association or Major League Baseball players are produced by state per capita, but never has their been research on a number of different sports at once, taking into account only the people that actually participate in high school sports and leaving out those who do not. With a more broad look into the data, more interesting questions can be brought up such as: What states produce the most professional athletes by different sport, and overall? Are certain states great at one sport and average/bad at another? How does Michigan stack up to the rest of the country? What role could these numbers play in the landscape of college athletics?

RESPONSES TO SUPPLY CHAIN DISASTERS
Lauren Jeong
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 277
Time: 3:15 PM - 5:00 PM
Mentor(s): Sriram Narayanan (Supply Chain Management), Claudia Rosales (Supply Chain Management)

When disaster strikes, affecting a business's operations and supply chain, how does the business' manager respond? Do they hold more safety stock? Do they diversify their supply base to create backups? Do they find completely different suppliers? Ultimately, the question we are asking is this: after experiencing disruptions to their operations due to natural disasters, how do managers adapt to protect their businesses from future disasters? In this research, we aimed to find all of the companies affected by the Japan tsunami and Thai floods. By sifting through information about the affected companies before, during, and after these disasters, we hoped to gain some insight into how managers actually respond after these situations to keep their businesses and supply chains sustainable into the future.

EXPLORING THE DETERMINANTS AND EFFECTS OF PROJECT MANAGER BEHAVIORS IN INTER-ORGANIZATIONAL AEC TEAMS
Priya Lall
Home Institution: Virginia Commonwealth University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 278
Time: 3:15 PM - 5:00 PM
Mentor(s): Sinem Korkmaz (Construction Management Program)

Organizations choose to collaborate with other organizations for many reasons, but mainly: to search, experiment, innovate and discover (i.e., exploration); or to refine, produce, implement and execute (i.e., exploitation). In the Architecture, Engineering, and Construction (AEC) industry, where organizations continuously collaborate to form project teams, the role of project manager is particularly critical to deliver projects within expected cost, time, and quality limits. This research explores project manager behaviors in inter-organizational AEC project teams that enable successful implementation of innovation in project delivery processes; if and how those change in exploring and exploiting types of relationships; and if delivery methods, contracts, and other delivery attributes impact those behaviors. To build a sound foundation in this research agenda, this study conducts an in-depth content analysis of the existing literature. Using the main stream research database such as ProQuest the researchers performed a keyword search that included: "inter-organizational, collaboration, communication, behaviors, innovation, architecture, engineering, and construction project teams, construction project teams, and project manager behaviors". This search resulted eight articles mainly coming from the Engineering, Construction, and Architectural Management Journal and Cost Engineering. We classified the articles into project manager behaviors, exploration and exploitation, and collaboration. The results will be that project manager's behaviors do effect the collaboration in inter-organizational AEC teams. Researchers can use these results for future studies of collaboration of inter-organizational project teams and project manager's behaviors. Practitioners will be able to have an understanding of the effectiveness of project manager's behaviors in the collaboration of inter-organizational project teams.

AMERICAN MUSLIMS ENTER HOLLYWOOD
Kanza Khan
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 3
Poster: 279
Time: 3:15 PM - 5:00 PM
Mentor(s): Simei Qing (James Madison College)

American Muslims step into the entertainment industry that has a strong influence to its audience. After 9/11, American Muslims have recognized the importance of presenting their stories to the world through film, television, and music. American Muslims have realized that in order for there to be understanding, stories must be told. Through the Muslim Public Affairs Council Hollywood Summit, I got a chance to meet with agents, producers, directors, and comedians that are American Muslims who have entered Hollywood because of their love for the industry. The delegates had a chance to hear their struggles in the industry as both a Muslim and as an artist. The people the delegates had a chance to meet stressed the importance of having Muslims in the entertainment industry. Under the guidance of Prof. Qing, this research analyzes the role American Muslims play in the industry and the role they play among American Muslim communities. Most of the research data comes from the MPAC Hollywood Summit conference 2013 because of the workshops we've had with successful American Muslims who are in Hollywood.

U.S. V NARCISO, PEREZ, & THE PRESS
Tiara Marocco
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 281
Time: 3:15 PM - 5:00 PM
Mentor(s): Geri Zeldes (Journalism)

My research project involves locating sources and creating a social media presence for the documentary film "U.S. v. Narciso, Perez & the Press."

WOMEN & CRIME
Danielle Brown
Home Institution: North Carolina Central University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 282
Time: 3:15 PM - 5:00 PM
Mentor(s): Charles Corley (Criminal Justice)

This empirical study is a theoretical exploration of the applicability of social disorganization theory relative to factors that potentially contribute to adult women's involvement in crime. This research enables the reader to understand how neighborhood constructs and other social variables can impact women's criminal behavior. Through secondary data analysis, variables are examined that influence criminal activity among adult women.

THE EFFECTS OF 3D PRINTING ON THE GLOBAL SUPPLY CHAIN
Oshan Weerasinghe
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 283
Time: 3:15 PM - 5:00 PM
Mentor(s): John Macdonald (Supply Chain Management)

This project will focus on how 3D printers will impact the global supply chains and what effects it may have in the near future. Research on this topic aims to illustrate the shift in production and manufacturing; and how it may affect the logistics, transportation and the warehousing of material. In addition, a secondary objective is to dive deeper into the technology and demonstrate its potential and current applications in the supply chain industry.

HAND WASHING

Sungmin Choi
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 284
Time: 3:15 PM - 5:00 PM
Mentor(s): Seunghyun Kim (Hospitality Business)

Hand hygiene compliance by healthcare providers has been difficult to achieve due to diverse environments, work culture, processes and task requirements. Because of this complexity, hand hygiene lends itself well to a human factors analysis in order to design a system that matches human cognitive and physical strengths and makes allowances for human limitations.

HANDWASHING IN FOODSERVICE ESTABLISHMENTS

Megan Maas
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 285
Time: 3:15 PM - 5:00 PM
Mentor(s): Jaemin Cha (Hospitality Business)

This study documents hand washing behaviors by patrons and employees at foodservice establishments. The length of time spent washing hands, whether or not soap was used, age of person, condition of sink, and method of drying are just a few of the conditions observed.

HOW DO THE TEMPERAMENT TRAITS AND PEER INTERACTION BEHAVIORS OBSERVED IN THE CDL STUDY DIFFER BETWEEN GENDERS? AND WITH OBSERVING THOSE BEHAVIORS, HOW DO THE OBSERVATIONS RECORDED BY CODERS COMPARE OR CONTRAST TO WHAT IS REPORTED BY PARENTS?

Katrin Reeder
Home Institution: Wheelock College
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 286
Time: 3:15 PM - 5:00 PM
Mentor(s): Emily Durbin (Clinical Psychology)

An observational study was conducted to examine how children's temperament traits play a role in how they build their peer or social relationships. Temperament traits influence children's emotional and social behavior; therefore they likely influence the quality of children's social relationships with their peers. This study included 82 children between the ages of 3 and 5 years who were observed several days per week across an entire school year in their preschool classroom. Temperament traits of all children were coded based on a global coding system (Durbin et al., 2005) where trained coders rated each trait of interest for 1-minute intervals. Separate sets of coders rated the children's social behaviors with peers and teachers. The present study will test whether there are sex differences on any of the observed temperament traits or peer interaction behaviors.

CASE STUDY RESEARCH IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Azureen Saiful Bahri
Home Institution: Michigan State University
Category: Social, Behavorial, and Economic Sciences, Section 4
Poster: 287
Time: 3:15 PM - 5:00 PM
Mentor(s): Tobias Schoenherr (Supply Chain Management)

While case study research is becoming increasingly popular, calls for more rigor and consistency have recently been made (Barratt et al., 2010). In order to examine and assess the rigor and consistency that has been applied in logistics and supply chain management case studies, we review relevant articles to provide a state of current practice, trends, and practices. We compare current research practice with guidelines provided by case research methodologists, and thus identify the gap that needs to be bridged. As such, the project intends to make the following two contributions: (1) a review of the current state of case study research in logistics and supply chain management, and (2) an identification of the gaps and research needs, yielding methodological recommendations enhancing rigor and relevance for future research.

RESEARCH MENTORS

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

BEAUMONT HOSPITAL
Neelam Tyagi, *Oncology*

CENTRAL MICHIGAN UNIVERSITY
Rebecca Uzarski, *Biology*

GRAND VALLEY STATE UNIVERSITY
Christopher Kurby, *Psychology*
Osman V Patel, *Cell and Molecular Biology*
William Schroeder, *Chemistry*
Robert Smart, *Chemistry*

OAKLAND UNIVERSITY
George Corser, *Computer Science*
Huirong Fu, *Computer Science and Engineering*
Jia Li, *Computer Science*
Jared Oluoch, *Computer Science and Engineering*
Mohamed Zohdy, *Computer Engineering*

MICHIGAN STATE UNIVERSITY
Julian Alford, *Electrical and Computer Engineering*
Eva Almenar, *Packaging*
Evangelyn Alocilja, *Biosystems and Agricultural Engineering*
Matthew Anderson, *Accounting*
James Anthony, *Epidemiology And Biostatistics*
Dean Aslam, *Engineering*
William Atchison, *Phamacology and Toxicology*
Seungik Baek, *Mechanical Engineering*
Venkatesh Balan, *Chemical Engineering and Material Science*
Namita Bansal, *Great Lakes Bioenergy Research Center*
Scott C Barton, *Chemical Engineering*
Julia Bell, *Large Animal Clinical Sciences*
Andre Benard, *Mechanical Engineering*
Mark Bezdek, *Plant and Soil Sciences*
Betul Bilgin, *Chemical Engineering and Materials Science*
J Roy Black, *Agricultural, Food, and Resource Economics*
Zachary Blount, *Microbiology and Molecular Genetics*
Jerrod Braman, *Radiology Osteopathic Medicine*
Federica Brandizzi, *Plant Biology*
Clifford Broman, *Sociology*
Juliette Brown, *Physiology*
Titus Brown, *Computer Science Engineering and Microbiology and Molecular Genetics*
Alita Burmeister, *MMG*
Andrea Busch, *Plant Biology*
Tamara Bush, *Mechanical Engineering*
Julia Busik, *Physiology Osteopathic Medicine*
Scott Bustabad, *National Superconducting Cyclotron Laboratory*
Mauricio Bustamante, *Biosystems Engineering*
Joseph Cesario, *Psychology*
Jaemin Cha, *Hospitality Business*
Prem Chahal, *Electrical Engineering*
Joyce Chai, *Computer Science*
Christina Chan, *Chemical Engineering and Materials Science*
Karim Chatti, *Civil and Environmental Engineering*
Debra Chester, *Medicine*
Jongeun Choi, *Mechanical Engineering*
Gary Cloud, *Mechanical Engineering*
Dirk Colbry, *Research Specialist and XSEDE Campus Champion Institute for Cyber-Enabled Research (iCER)*
James Coletta, *Biosystems Engineering*
Alexandra Colon-Rodriguez, *Comparative Medicine and Integrative Biology Program*
Sarah Comstock, *Food Science and Human Nutrition*
Jeffrey Conroy-Krutz, *Political Science*
Bryan Copple, *Pharmacology and Toxicology*
Charles Corley, *Criminal Justice*
Patricia Crawford, *SPDC*
Elahé Crockett, *Medicine*
Elahe Crockett-Torabi, *Medicine*
Jeffrey Cruz, *Biochemistry and Molecular Biology*
Leonardo da Costa Sousa, *Chemical Engineering and Material Science*
Sudhanwa Dewasthale, *Chemical Engineering*
Lixin Dong, *Electrical & Computer Engineering*
Anne Dorrance, *Pharmacology and Toxicology*
Lawrence Drzal, *CMSC*
Daniel Ducat, *Biochemistry and Molecular Biology*
Emily Durbin, *Clinical Psychology*
Fred Dyer, *Zoology*
Heather Eisthen, *Zoology*
Susan Ewart, *Large Animal Clinical Sciences*
Maddalena Fanelli, *Chemical Engineering*
Ken Farminer, *Chemical Engineering and Material Sciences*
Eva Farre, *Plant Biology*
Jenifer Fenton, *Food Science and Human Nutrition*
Monique Floer, *BMB*
John Fyfe, *Microbiology and Molecular Genetics*
James Galligan, *Pharmacology and Toxicology*
Kathleen Gallo, *Physiology*
Selvarani Ganesan, *Chemical Engineering*
Mahlet Garedew, *Biosystems & Agricultural Engineering*
Bikki Gautam, *Medicine*
Dan Graiver, *Chemical Engineering and Material Sciences*
Andrew Grossman, *Mechanical Engineering*
Brian Gulbransen, *Physiology*
Elodie Halbot, *CHEMS*
Katherine Halievski, *Neuroscience*
Heidi E Hannon, *Comparative Medicine & Integrative Biology*
Mahmood Haq, *Mechanical Engineering*
Jack Harkema, *Pathobiology and Diagnostic Investigation*
Syed Hashsham, *Civil and Environmental Engineering*
Roger Haut, *Radiology and Osteopathic Medicine*
Eric Hegg, *Biochemistry & Molecular Biology*

Nick Hobbs, *IBSB*
David Hodge, *Chemical Engineering & Materials Science*
Susanne Hoffman-Benning, *Biochemistry*
Tim Hogan, *ECE*
Kay Holekamp, *Zoology*
Mary Holschbach, *Neuroscience*
Claudia Holzman, *Epidemiology and Biostatistics*
James Jackson, *Chemistry*
William Jackson, *Pharmacology & Toxicology*
Indumathy Jayamani, *Civil and Environmental Engineering*
Jacob Jensen, *Plant Biology*
Cuihong Jia, *Pharmacology and Toxicology*
Mingjie Jin, *Chemical Engineering and Material Science*
Nathan Johnson, *Plant Biology*
A Daniel Jones, *Biochemistry & Molecular Biology Cns*
Adam Jordan, *Plant Research Labs*
Cynthia Jordan, *Neuroscience*
Matthew Juergens, *Plant Biology*
Mark Kadrofske, *Pediatrics and Human Development*
Oleksii Karpenko, *Electrical and Computer Engineering*
Jason Keagy, *Zoology*
Andrew Keen, *iCER*
Seunghyun Kim, *Hospitality Business*
Andras Komaromy, *Small Animal Clinical Sciences*
Manoochehr Koochesfahani, *Mechanical Engineeering*
Sinem Korkmaz, *Construction Management Program*
David Kramer, *Biochemistry and Molecular Biology*
Meta Kreiner, *Anthropology Social Science*
Ki Yong Kwon, *Electrical Engineering*
Patrick Kwon, *Mechanical Engineering*
Nizar Lajnef, *Civil and Environmental Engineering*
Jennifer Langel, *Neuroscience Program*
Lisa Lapidus, *Phy. and Ast.*
John J LaPres, *Biochemistry & Molecular Biology*
Tae Hyung Lee, *Physiology*
Gina Leinninger, *Physiology*
Nora Lewin, *Zoology*
Guojing Li, *Mechanical Engineering*
Jie Li, *biochemistry*
Wen Li, *Electrical and Computer Engineering*
Wei Liao, *Biosystems & Agricultural Engineering*
Peter Lillehoj, *Mechanical Engineering*
Dahsin Liu, *Mechanical Engineering*
Yan Liu, *Biosystems & Agricultural Engineering*
Yang Liu, *Mathematics*
Ying Liu, *Chemical Engineering*
Zhiguo Liu, *Biosystems Engineering*
Johnny Lloyd, *Plant Biology*
Joseph Lonstein, *Psychology*
Alfred Loos, *Mechanical Engineering*
Douglas Luckie, *Physiology*
Richard Lunt, *Chemical Engineering and Material Science*
John Macdonald, *Supply Chain Management*
Robert Maleczka, *Chemistry*
Linda Mansfield, *Large Animal Clinical Sciences*
Terence Marsh, *Microbiology*
Erik Martinez-Hackert, *Biochemistry & Molecular Biology*
Carmel Martin-Fairey, *Neuroscience*
Nusrat Matin, *Pharmacology and Toxicology*
Louise Mead, *BEACON*
Ronald Meyer, *Biophysical and Science*
Dennis Miller, *Chemical Engineering and Materials Science*
Melissa Millerick-May, *Medicine*
Kei Minamisono, *Physics*
Jade Mitchell, *Biosystems and Agricultural Engineering*
Puliyur Mohankumar, *Pharmacology and Toxicology*
Sheba Mohankumar, *Pharmacology and Toxicology*
Michigan Sttae University
Ali Mohebi, *Electrical and Computer Engineering*
Margaret Mohr, *Neuroscience*
Susanne Mohr, *Physiology*
Ann Mongoven, *Center for Ethics and Humanities in the Life Sciences*
Merry Morash, *School of Criminal Justice*
Cheryl Murphy, *Fisheries and Wildlife*
Ramani Narayan, *Chemical Engineering and Material Sciences*
Sriram Narayanan, *Supply Chain Management*
Aritro Nath, *Chemical Engineering and Materials Science*
Jason Nicholas, *Chemical Engineering and Materials Science*
Jing Ning, *Biochemistry & Molecular Biology*
Antonio Nuez, *Neuroscience*
Adesuwa Olomu, *Medicine*
David Olson, *Mechanical Engineeering*
Ben Ong, *iCER*
Karim Oweiss, *Electrical and Computer Engineering*
Fernanda Paes, *Civil and Environmental Engineering*
Ronghui Pan, *Plant Biology*
Nicholas Panchy, *Genetics*
Narayanan Parameswaran, *Physiology*
Kyoung Park, *Electrical Engineering*
Simon Petersen-Jones, *Small Animal Clinical Sciences*
Wendy Powers-Schilling, *Animal Science/Biosystems Engineering*
Likit Preeyanon, *Microbiology*
Denis Proshlyakov, *Chemistry*
Simei Qing, *James Madison College*
Clark Radcliffe, *Mechanical Engineering*
Emilee Rader, *Telecom, Information Studies and Media*
R M Nishanka Dilini Ratnayake, *Chemistry and Biochemistry and Molecular Biology*
Peter Reeves, *Osteopathic Surgical Specialties*
Dawn Reinhold, *Biosystems & Agricultural Engineering*
Ryan Ringle, *National Superconducting Cyclotron Laboratory*
Kristen Risley, *Zoology*
Lorraine Robbins, *Nursing*
Eileen Rodriguez-Tapia, *Neuroscience Program*
Claudia Rosales, *Supply Chain Management*
Kenneth Rosenman, *Medicine*
Rebecca Roussey, *Plant Biology*
Zhenhua Ruan, *Biosystems Engineering*
Cristina Ruberti, *Plant Biology*
Ann Marie Ryan, *Organizational Psychology*

Steven Safferman, *Biosystems and Agricultural Engineering*
Christopher Saffron, *Biosystems & Agricultural Engineering*
Jeff Sakamoto, *Materials Science Engineering*
Linda Savage, *Biochemistry and Molecular Biology*
Tobias Schoenherr, *Supply Chain Management*
Yair Shachar-Hill, *Plant Biology*
Thomas Sharkey, *Biochemistry*
Cheryl Sisk, *Neuroscience and Psychology*
Laura Smale, *Psychology*
Won Song, *Food Science and Human Nutrition*
Dana Spence, *Chemistry*
Jim Stapleton, *Chemical Engineering and Material Science*
Giovanni Stefano, *Plant Biology*
Brenda Sternquist, *Marketing*
Mariam Sticklen, *Plant, Soil and Microbial Sciences*
Ryan Stoklosa, *Agricultural Engineering*
Greg Swain, *Chemistry*
Tomomi Takeuchi, *Plant Biology*
Xiaobo Tan, *Electrical & Computer Engineering*
Volodymyr Tarabara, *Civil and Environmental Engineering (CEE)*
Ryan Thompson, *Cell and Molecular Biology*
Travis Thompson, *Materials Science (CHEMS)*
Elisa Toulson, *Mechanical Engineering*
Nathalie Trottier, *Animal Science*
Lalita Udpa, *Electrical and Computer Engineering*
Patric Vaelli, *Zoology*
Steve van Nocker, *Horticulture*
Kami Vaniea, *Telecom, Information Studies and Media*
Balan Venkatesh, *Chemical Engineering and Material Science*
Daniel Vocelle, *Chemical Engineering*
Kevin D Walker, *Chemistry and Biochemistry and Molecular Biology*
Patrick Walton, *Chemical Engineering and Materials Science*
Xiaoqing Wang, *Biosystems Engineering*
Rick Wash, *Journalism*
Christopher Waters, *Microbiology & Molecular Genetics*
Stephanie Watts, *Pharmacology and Toxicology*
Brian Weaver, *Mechanical Engineering*
Guowei Wei, *Mathematics*
Emily Weigel, *Zoology*
Sean Weise, *Biochemistry*
Timothy Whitehead, *Chemical Engineering and Materials Science*
Curtis Wilkerson, *Biochemistry and Molecular Biology*
Barry Williams, *Zoology*
Dan Williams, *Chemical Engineering*
Duanghathai Wiwatratana, *Phamacology and Toxicology*
Mark Worden, *Chemical Engineering*
Xinran Xiao, *Mechanical Engineering*
Hui Xu, *Pharmacology and Toxicology*
Lily Yan, *Psychology*
Qing Yang, *Chemical Engineering and Materials Science*
Yang Yang, *Great Lakes Bioenergy Research Center*
Vilma Yuzbasiyan-Gurkan, *Canine Genetics*
Geri Zeldes, *Journalism*
Aklilu Zeleke, *Lyman Briggs College*
Jianguo Zhao, *ECE*
Yuan Zhong, *Biosystems and Agricultural Engineering*
Alison Cupples, *Civil and Environmental Engineering*
Laura Dilley, *Communicative Sciences and Disorders*
Norbert Kaminski, *Center for Integrative Toxicology*
Elijah Lowe, *Computer Science and Engineering*
Dave Weatherspoon, *Agricultural, Food and Resource Economics*
Karen Williams, *Obstetrics, Gynecology & Reproductive Biology*
Scott Witter, *SPDC*
Cheryl Rockwell, *Pharmocology & Toxicology*

PRESENTER INDEX

Presenters are listed alphabetically by last name.