Michigan State University









7.23.2014

MID-SURE

MID-MICHIGAN SYMPOSIUM FOR
UNDERGRADUATE RESEARCH EXPERIENCES

WELCOME

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

Undergraduate students from diverse academic disciplines will present their outstanding research and creative endeavors at Mid-SURE. Approximately 295 students from 90 different institutions are participating in today's event. These students are mentored by 301 faculty members, post-doctoral researchers, and graduate students.

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

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

MID-SURE PLANNING COMMITTEE

Megan A. Shannahan
Assistant Director, Undergraduate Research

Korine Wawrzynski
Assistant Dean, Academic Initiatives &
Director, Undergraduate Research

Judi Brown Clarke
Diversity Director, BEACON

Katy Luchini Colbry
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Steven D. Thomas
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Cover image designed by Ashley Brimley, '14, 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, BEACON, EnSURE, REPID, and SROP. Program descriptions and contact information are provided below.

BEACON

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

ENGINEERING SUMMER UNDERGRADUATE RESEARCH EXPERIENCE

The Michigan State University College of **Engineering 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 Initiatives and EnSURE Coordinator, at colbryka@msu.edu.

REPID PROGRAM

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

SUMMER RESEARCH OPPORTUNITIES PROGRAM

The **Summer Research Opportunities Program (SROP)** is a gateway to graduate education at Michigan State University. The goal of the program is to increase the number of domestic 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.

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 – 2:00 PM	Session 1 presentations	Concourse level
2:00 – 3:00 PM	Session 2 presentations	Concourse level
3:00 – 4:00 PM	Session 3 presentations	Concourse level
1:00 – 4:00 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 – 2:00 PM	SESSION 2 SECTIONS 2:00 – 3:00 PM	SESSION 3 SECTIONS 3:00 – 4:00 PM
Agriculture & Animal Science	1	-	-
Biochemistry & Microbiology	1 & 2	3 & 4	5 & 6
Biosystems & Agricultural Engineering	1	2	3
Cell Biology, Genetics, & Genomics	1	2 & 3	4 & 5
Chemical Engineering & Materials Science	1 & 2	3 & 4	5 & 6
Civil & Environmental Engineering	1	2	3
Computer Science & Engineering	1	2	-
Electrical & Computer Engineering	1	2	3
Epidemiology & Public Health	-	1	2
Integrative Biology	1 & 2	3 & 4	5 & 6
Mechanical Engineering	1 & 2	3	4 & 5
Physical & Mathematical Sciences	1	2	-
Social, Behavioral, & Economic Sciences	1 & 2	3 & 4	5 & 6

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	Abid Ahmad	Saba Jaleel	Gloria Calderon	Eric Ofori-Peprah
8:15-8:30 AM	Vinh Dang	Sarai Garcia	Christina Pressley	Ashley Butler
8:30-8:45 AM	Monica Setien	Cassandra Lamarche	Christian Bonilla	Marven Cantave
8:45-9:00 AM	Rebekka Pace	Dominique Garrison	Stephanie Mayo	Olivia Leaven
9:00-9:10 AM	BREAK			
9:10-9:25 AM	Gerald Lilly	Javier Mulero-Sierra	Victoreea Harris	Courtney Bryant
9:25-9:40 AM	Ashley Lyles	Shawna Rowe	Shavonda Johnson	Christian Murillo
9:40-9:55 AM	Hines Croshon	Evita Moody	Hunter Salem	Azel King
9:55-10:10 AM	Ronald Roseman	Alana Page	Stephanie Price	Monique Noel
10:10-10:20 AM	BREAK			
10:20-10:35 AM	Faith Thorton	Melanie Jamel	James Gamble	Eboney Stallworth
10:35-10:50 AM	Holly Semma	Sylmarie Davila-Montero	Kenneth Rankins	Elena Alemayehu
10:50-11:05 AM	Reynier Moreno	William Terrell	Paola Chavez	James Martin
11:05-11:20 AM	Luis Martinetti	Veronica Tijerina	Tatiana Rosario	Azeez Ibrahim

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	Psychology/Public Policy & Leadership
American University of the Caribbean	Admissions
Cleveland Clinic	Molecular Medicine
Cooley Law School	Admissions
Governors State University	College of Health & Human Services
Indiana University	School of Public & Environmental Affairs
Madonna University	Graduate School
Michigan School of Professional Psychology	Student Services
Michigan State University	Business Analytics
Michigan State University	College of Engineering
Michigan State University	Epidemiology & Biostatistics
Michigan Technological University	Graduate School
National College of Natural Medicine	Admissions
Purdue University	Graduate School
Northwestern University	McCormick School of Engineering & Applied Science
St. John's University	Graduate Admission
The Ohio State University	Graduate School
University of Michigan	Program in Survey Methodology
University of Michigan	School of Public Health
University of Michigan	Taubman College of Architecture & Urban Planning
University of Notre Dame	ESTEEM Graduate Program/Patent Law
University of Notre Dame	Graduate School
Van Andel Institute	PhD Graduate Program
Washington University	Biology & Biomedical Sciences
West Virginia University	Graduate Admissions
Western Michigan University	Graduate College

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

MANIPULATING PLANT DEVELOPMENT THROUGH EXPRESSION OF A MUTANT HISTONE
Javier Mulero Sierra
Home Institution: Universidad del Este
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:00 PM
Poster: 1
Mentor(s): Steve van Nocker (Horticulture)

Proper development of plants and animals depends on precise regulation of gene expression. The evolutionarily conserved PRC2 complex has an important role in regulating developmentally important genes, by methylating histone H3 at lysine-27 (H3K27me3). In humans, mutations in histone H3 that convert K27 to methionine (H3K27>M) inhibit the catalytic subunit of PRC2, a protein called EZH2, leading to certain cancers. PRC2 is critical for plant development, although all of its roles are not yet known. In this project we will evaluate the potential for disrupting PRC2 activity in plants through targeted expression of H3K27>M. EZH2 has three orthologous proteins in Arabidopsis: CURLY LEAF (CLF), SWINGER (SWN), and MEDEA (MEA). Using domain and homology analyses, we found that all three proteins contain a tyrosine within the potential active site, at the position that is implicated in inhibition of EZH2 by H3K27>M. Using public microarray data, we found that SWN is expressed strongly throughout the plant, while CLF and MEA show tissue-specific expression patterns. We designed genetic constructions to express H3K27>M in several developmental contexts to attempt to disrupt PRC2 activity and understand its role. The results of this research can help us get a greater view of how these genes are expressed. However, we gain potential to engineer phenotype in a sophisticated manner.

THE QUALITY OF CRANBERRY JUICE DURING STORAGE
Hines Croshon
Home Institution: Alabama A&M University
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:00 PM
Poster: 2
Mentor(s): Kirk Dolan (Food Science & Human Nutrition), Sunisa Roidoung (Food Science)

Quality properties such as color, anthocyanins, and antioxidants were examined in this study. These properties describe the make-up of the different components in cranberry juice. They are significant parameters critical to process optimization, product design, stability and quality preservation. The high percentage of cranberries is used as juice throughout the world; hence little research has been done on the quality of cranberry juice. We hypothesized that subsequent vitamin C additions will increase degradation in color, and anthocyanins. The degradation kinetics of the anthocyanins follow the first-order equation reaction. The concentrations of vitamin C used in this study were 0, 20, 40 mg/100mL. Each sample was pasteurized at 85 degrees Celsius for 1 minute. We used pH differential method to determine the presence of anthocyanins, pH 1.0 and pH 4.5 buffer solutions are needed for this method. Juice color is evaluated by spectrophotometer at wavelength 520 nm. Antioxidant activity is determined by ORAC assay (Oxygen Radical Absorbance Capacity), monitoring through the damage of fluorescent compounds were conducted in three replicates. In conclusion, the color in cranberry juice and the presence of anthocyanins degrades during storage time.

MEASUREMENT OF TISSUE FACTOR ACTIVITY AS A BIOMARKER FOR INDICATING INFECTION OF THE SPINAL CORD VASCULATURE WITH EQUINE HERPESVIRUS-1 (EHV-1)
Kenisha Y Rivera Adames
Home Institution: University of Puerto Rico at Mayagüez
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:00 PM
Poster: 3
Mentor(s): Gisela Soboll Hussey (Veterinary Medicine)

Background: Equine herpesvirus type 1 (EHV-1) infection is highly prevalent in domestic horses and has significant economic and welfare implications. It causes respiratory disease, late-term abortion, neonatal foal death, equine herpesvirus myeloencephalopathy (EHM) and chorioretinopathy. EHM is the most devastating manifestation of EHV-1 and often requires euthanasia. Despite the significant impact of EHM, its pathogenesis remains poorly understood. Because inflammation, thrombosis and ischemia of the central nervous system (CNS) endothelia are thought to be important for EHM pathogenesis, we hypothesize that activation of tissue factor may play a role during the events leading to EHM. Hypothesis: Infection and pathology at the vascular endothelium can be identified by studying tissue factor (TF) activity following infection of horses with EHV-1. Methods: Eight horses were experimentally infected with EHV-1. Blood samples were collected prior infection and daily for 10 days after experimental infection with EHV-1. In addition cerebrospinal fluid (CSF) was collected prior to infection and on day 11 post-infection. Leukocyte subsets were identified and analysis and measurement of TF activity in PBMCs and CSF was performed and correlated with clinical data, viremia and viral nasal shedding following infection. Results: We expect to see increases in TF activity in PBMCs collected from

infected horses during viremia because infected PBMCs facilitate infection of spinal cord vascular endothelia. In addition we expect to detect TF expression in CSF collected post-infection. These levels may be increased in horses that develop clinical EHM.

THE EFFECTS OF LOWER PROTEIN LEVELS ON SOW LACTATION AND HEAT INCREMENTS
Alexandria Bufford
Home Institution: Tuskegee University
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:00 PM
Poster: 4
Mentor(s): Nathalie Trottier (Animal Science)

In the swine industry, weather conditions has a large effect on the sow performance. The swine industry in the US holds heat stress responsible for over $299 million annual loss. Farms have to figure out new cost efficient ways to keep sows cool. Swine lack the ability to sweat in order to reduce their body temperature and are effected greatly by high temperatures. There has been a move to find new ways to control the sow's temperature in the housing units to prevent overheating. The reproductive sow is the most effected by heat stress. She has to dissipate more heat, as lactation and gestation contribute greatly to the sow's heat increment. (Black et al. 1992). Overheating causes a loss in appetite, and poor lactation. Under heat stress, the sow's heart rate decreases and blood flow increases. She then, must make additional metabolic alterations in an attempt to maintain thermal homeostasis. Although the increased blood flow may seem beneficial to the mammary gland, but to expel heat the sow must repartition blood flow to the skin and ears. This redirection of blood has little effect on lactation if only experienced for a day, but sows subject to prolonged heat stress, even if there are intermittent breaks in the heat, effect milk production. This causes decreased suckling time and lower piglet gain and viability. Our focus in this study is to see if lower protein levels in the sow's diet will maintain lactation performance and lower heat increments.

EFFECTS OF NITROGEN AND LIGHT ON RHIZOBIUM-LEGUME SYMBIOSIS
Chantia Sulph
Home Institution: Albany State University
Category & Time: Agriculture and Animal Science, Section 1, 1:00 PM - 2:00 PM
Poster: 5
Mentor(s): Tomomi Suwa (Plant Biology)

Rhizobia are nitrogen-fixing bacteria that form symbiotic relationship with leguminous plants. Rhizobia supply the legume with fixed nitrogen, and the plant provides rhizobia with photosynthetic carbon (sugar). This symbiotic relationship between a legume and its nitrogen-fixing bacteria is mutualistic, with both partners benefiting. However, this interaction is not always mutualistic. Here I studied how their interactions may change under different environmental conditions. I hypothesized that different abiotic factors, can suppress the growth and symbiotic characteristics of rhizobia. To test this hypothesis, I conducted a greenhouse experiment manipulating light and soil nitrogen in presence and absence of rhizobia. I found that the legume species in the shaded area experienced an increase in growth compared to those in the ambient area. The effects of adding even more fixed nitrogen to the soil is used in agriculture to which most commercial crops benefit indirectly from symbiotic nitrogen fixation. The soil fertility for agriculture lies in the direction for future research of legume-rhizobium mutualistic relationship. The ability of plants to incorporate fixed nitrogen into proteins and other organic substances has a major impact on human welfare.

BIOCHEMISTRY & MOLECULAR BIOLOGY

CORTICOTROPIN RELEASING HORMONE (CRH) EXPRESSION IS ELEVATED IN AN ANIMAL MODEL OF IRRITABLE BOWEL SYNDROME (IBS)
Andrew Mecca
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 7
Mentor(s): James Galligan (Pharmacology and Toxicology)

Irritable bowel syndrome (IBS) is a common functional gastrointestinal disorder characterized by changes in digestive motility and visceral hypersensitivity. Serotonin signaling is altered in IBS patients, as gene polymorphisms encoding the serotonin transporter (SERT) increase the availability of serotonin in the gut. Additionally, fifty percent of IBS patients suffer from anxiety disorders in which both serotonin and corticotropin releasing hormone (CRH) signaling is altered, suggesting an impairment in the brain-gut axis. CRH administration has been shown to increase colonic motility and visceral sensitivity, consistent with IBS symptoms. It is suggested that IBS patients may display an exaggerated response to stress compared to healthy individuals, as normal levels of CRH in IBS patients cause visceral pain and digestive changes. Gene array data indicates that mRNA coding for CRH is up-regulated 117-fold in sensory neurons supplying the gastrointestinal tract of SERT knockout (SERT KO) rats, which serves as an animal model of IBS. Although a difference was observed at the mRNA level, immunohistochemistry methods were used to compare the subsequent protein expression of CRH between SERT KO and wildtype animals. A statistically significant elevation in the CRH gene product was observed in the dorsal root ganglia (DRG) of SERT KO rats, consistent with our mRNA data. These results provide evidence supporting the involvement of CRH in IBS pathology. Future studies will focus on localizing the gastrointestinal innervation of CRH-elevated sensory neurons.

FURTHER DEFINING ACYLSUGAR STRUCTURAL DIVERSITY WITHIN *PETUNIA AXILLARIS*
Mollie Enright
Home Institution: Gordon College
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 8
Mentor(s): Xiaoxiao Liu (Chemistry)

The glandular trichomes of Solanaceous plants, including the genus *Petunia*, are major centers of secondary metabolite synthesis, storage, and secretion. Of the compounds produced in these trichomes, acylsugars are of particular interest because they play an important role in plant defense against insect attack. These acylsugars are derived from glucose or sucrose molecules by esterification of a variety of aliphatic esters on the sugar core, resulting from a multitude of metabolic transformations of organic acids (Kroumova and Wagner, 2003). Within *Petunia*, it has been made known that two major groups of acylsugars are produced, malonate acylsugars and neutral acylsugars. Extracts from the leaf tissue of *Petunia axillaris* have been used to isolate acylsugars produced in the trichomes. Using selective solid phase extraction (SPE) based on anion-exchange, malonate acylsugars have been separated from neutral acylsugars. Semi-preparative HPLC was then used to further isolate individual metabolites to be characterized using time-of-flight mass spectrometry and various 2-D NMR techniques. The result of this work will be a more complete profile of the diversity of acylsugars produced by *Petunia axillaris* that can accelerate discovery of the genetic basis for acylsugar diversity in *Petunia* species.

SCREENING FOR ATP SULFURYLASE INTERACTING PROTEINS IN PLANTS
Jessica Noll
Home Institution: Manchester University
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 9
Mentor(s): Anne-Sophie Bohrer (Biochemistry and Microbiology), Hideki Takahashi (Biochemistry and Microbiology Cns)

Sulfur is an essential macronutrient for the growth and survival of all organisms. ATP sulfurylase (ATPS) is the first enzyme that catalyzes the conversion of sulfate to adenosine 5′-phosphosulfate in sulfur metabolism. In Arabidopsis thaliana, all four ATPS genes (ATPS1, -2, -3 and -4) may encode functional ATPS localizing in plastids as they contain N-terminal transit peptides for plastid protein targeting; however the ATPS enzymatic activity is detected in both cytosol and plastids. Sequence analysis indicates that ATPS2 contains four AUG codons in the transit peptide region, suggesting that ATPS2 mRNA may be alternatively translated to produce a cytosolic isoform. Recent results obtained in our lab indicate that alternative translation of ATPS2 can occur at the AUG codon for the Methionine-52 to produce an isoform present in cytosol in Arabidopsis. Specific function and roles of the cytosolic ATPS2 (cyt-ATPS2) in sulfur metabolism are investigated by screening for cyt-ATPS2-interacting proteins using a yeast two-hybrid approach. The cDNA library was prepared using mRNA extracted from Arabidopsis roots cultured under sulfur-deprived conditions. The cDNA library was fused with the activating domain (AD) of the yeast Gal4 transcription factor. The cyt-ATPS2 was cloned in frame with the yeast Gal4 DNA binding domain (BD) to be used as the bait for the yeast two-hybrid screening. Yeast strains expressing the bait (Gal4-BD-cyt-ATPS2) and the prey (Gal4-AD-cDNA library) were mated for screening, testing interactions between cyt-ATPS2 and proteins expected to be associated with cyt-ATPS2 for modifying the flux of sulfur metabolism in the cytosol.

C-PEPTIDE SECRETIONS AND DIFFUSION FROM RAT INSULINOMA CELLS USING 3-D PRINTED FLUIDIC DEVICE
Azel King
Home Institution: Medgar Evers College
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 10
Mentor(s): Chengpeng Chen (Chemistry), Yueli Liu (Chemistry), Dana Spence (Chemistry)

C-peptide is a 31 amino acid peptide that is co-secreted with insulin by the Fcells in the pancreas. It was found that its main role was to facilitate folding of the pro-insulin molecule. Recently, research has shown that C-peptide has beneficial effects in vivo and may be a valuable source in diabetes therapy. Research has shown that C-peptide has an effect on erythrocytes (red blood cells, RBCs) by promoting ATP release from the cells, which stimulates nitric oxide (NO) production in endothelial cells, which further relaxes smooth muscle cells on vessel walls. In this study, a cell line known as INS-1 was used to produce endogenous C-peptide that would be used on a 3D-printed circulation mimic fluidic device. The secretion pattern of C-peptide as a function of time was first studied, by measuring C-peptide in the solution above cultured cells at different time points. Then the cultured INS-1 cells were integrated onto the circulation device to mimic the endocrine process of C-peptide exiting pancreatic islets and entering the circulation. Specifically, the amount of C-peptide that diffused from INS-1 cell culture wells into the circulation was detected against time. Enzyme linked immunosorbent assay (ELISA) was used to quantify the amount of C-peptide that diffused from INS-1 cells into the circulation as a function of time. Results showed that 25 nM C-peptide was released by the INS-1 cells and approximately 2 nM diffused into the device channel, thus providing a working mimic of Fcell secretion that occurs in vivo.

EFFECTS OF CHRONIC LOW-DOSE ANTI-TELOMERASE AND CHEMOTHERAPEUTIC DRUGS ON BREAST CANCER CELLS
Chelsea Reiber
Home Institution: Grand Valley State University
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 11
Mentor(s): Alexander Fisch (Grand Valley State University: Cell and Molecular Biology), Osman Patel (Grand Valley State University: Cell and Molecular Biology), William Schroeder (Grand Valley State University: Chemistry), Robert Smart (Grand Valley State University: Chemistry)

Breast cancer is the second leading cause of death among women in the United States. Among the different molecular sub-groups of breast cancer, the most invasive is Triple-Negative Breast Cancer (TNBC). TNBC also has the worst prognosis, decreased overall survival rate and no targeted therapy available. On-going research is investigating new strategies and therapies for TNBC. Therefore, this study's objective was to compare and contrast the effects of continuous low-dose of BIBR 1532, a novel analogue of BIBR 1532

(GV6), Paclitaxel and Doxorubicin on breast cancer (MDAMB 231) cells. Culture flasks (T-25) were seeded with approximately $5.0x10^5$ cells/ml and supplemented with GV6 (n=4-8) or BIBR 1532 (n=4-8) or Doxorubicin (n=4-8) or Paclitaxel (n=4-8) or non-drug supplemented media (Control, n=4-8) for 21 days. Trypan Blue (Gibco) exclusion test was utilized to assess the viability of the cells. BIBR 1532, Doxorubicin and Paclitaxel reduced ($P<0.05$) proliferation of the cancer cells by approximately 20-35% by day 7 of treatment compared to the Control. By day 21 of low-dose GV6, BIBR1532, Doxorubicin and Paclitaxel supplementation, the cell counts dropped to about 25% ($P<0.05$), 55% ($P<0.05$), 75% ($P<0.05$) and 50% ($P<0.05$) of Control, respectively. Our results indicate that continuous low dose anti-telomerase and chemotherapeutic drugs do inhibit breast cancer cell proliferation and merits further investigation.

CHARACTERIZING AMINOMUTASES: ASSESSING THE STEREOCHEMISTRY OF A TYROSINE AMINOMUTASE FROM RICE AND DEVELOPING AN R323K MUTANT OF *Pa*PAM AS A FLUORESCENCE-TAG PROTEIN

Johnathon Hall
Home Institution: Spring Arbor University
Category & Time: Biochemistry and Microbiology, Section 1, 1:00 PM - 2:00 PM
Poster: 12
Mentor(s): Kevin D. Walker (Chemistry), Tyler Walter (Chemistry)

Aminomutases are enzymes that can convert α- into β-amino acids. β-Amino acids serve as building blocks on the biosynthetic pathways to many biologically active compounds. Phenylalanine aminomutases (*Tc*PAM) from *Taxus* plants and *Pa*PAM from *Pantoea* bacteria catalyze heterolytic reactions, using an MIO (methylidenimidazolone) prosthetic group in the active site. *Tc*PAM is on the pathway to the chemotherapeutic drug paclitaxel, while *Pa*PAM lies on the pathway to the antibiotic andrimid. The detailed mechanisms are known for the two PAMs and a related tyrosine aminomutase (*Cc*TAM) from *Chondromyces*. Here, we use gas chromatographic-mass spectrometric (GC-MS) and NMR analyses to assess the stereochemistry, mechanism, and kinetics of a recently discovered MIO-dependent *Os*TAM from *Oryza sativa* (rice). Looking to repurpose *Pa*PAM as a fluorescent-tag protein, we made an R323K mutant of *Pa*PAM (*mPa*PAM) to theoretically form a Schiff base in the active site with an aromatic propenal substrate. After expressing and purifying *mPa*PAM, the activity of the mutant and wild-type enzyme was compared. Additionally, cinnamaldehyde was used as an irreversible inhibitor, potentially forming a chromophoric conjugated imine adduct with the lysine in the catalytic site. *mPa*PAM was incubated with cinnamaldehyde and the solution turned orange. UV-Vis spectrophotometry will be used to analyze changes in the absorbance spectrum between *mPa*PAM and *Pa*PAM when incubated with cinnamaldehyde. Phenylalaninal, proposed to be more water-soluble than cinnamaldehyde, is imagined to diffuse better into the active site; creating a similar imine adduct after deamination. Future experiments look to mutate *Pa*PAM to alter the substrate specificity for better fluorophores.

COMPARING ASAT2 ENZYME ACTIVITY IN WILD TOMATO SPECIES

Abigail Miller
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 2, 1:00 PM - 2:00 PM
Poster: 14
Mentor(s): Pengxiang Fan (Biochemistry and Microbiology)

Glandular trichomes in tomato plants secrete acyl sugars, which are a natural pesticide for the plant. Acyl sugars are made in an enzymatic biosynthesis pathway catalyzed by acyltransferase. The main focus for this project is to study the ASAT2 enzyme, which adds an acyl chain to the 3' position of a monoacyl sucrose to make a diacyl sucrose. The enzyme of the M82 (S. lycopersicum) cultivated tomato allele adds C12 or aiC5 chain on the monacyl sucrose in the second step of the acyl sucrose biosynthesis pathway; however, it does not add iC5 at this position. Recent studies showed the ASAT2 orthologous gene has a 1-7% amino acid difference between wild tomato species and M82. In this research, we cloned the ASAT2 gene in different wild tomato species, expressed the protein, and tested the enzyme activity. Interestingly, we found enzyme alleles from two accessions: 1969 (S. chilenese) and 2172 (S. aracanum) that can add C12 or aiC5 on the 3' position, like M82; however, the enzymes can also add iC5 to the monacyl sucrose as well. Comparing the amino acid sequence of the ASAT2 orthologous genes, four amino acid substitutions in the wild accessions might be responsible for the change in acyl-CoA binding affinity on the ASAT2 enzyme. This study comparing acyltransferase activity will help in the understanding and manipulation of acyl sucrose biosynthesis in the future.

CYCLIC VOLTAMMETRIC STUDIES OF ELECTROACTIVE NEUROTRANSMITTERS AT DIFFERENT CARBON ELECTRODES

Prerna Priyadarshani
Home Institution: Amity University Rajasthan
Category & Time: Biochemistry and Microbiology, Section 2, 1:00 PM - 2:00 PM
Poster: 15
Mentor(s): Greg Swain (Chemistry)

Neurotransmitters (NTs) are endogenous chemicals in the body that transmit signals across a synapse from one neuron to another 'target' neuron or from one neuron to a target cell. Many of these compounds are electrochemically active so small electrodes can be used to measure (*in vitro* or *in vivo*) changes in local concentration of a NT, in response to a stimulus, generally as an oxidation current. Various carbon electrodes are most often used for this measurement. For the electrodes to perform optimally in this measurement, great care must be taken to control the surface cleanliness, microstructure and chemistry. In this project, the oxidation of norepinephrine, dopamine and serotonin was studied using cyclic voltammetry in phosphate buffer pH 7.2. The response of three different planar carbon electrodes was compared: glassy carbon, boron-doped diamond and tetrahedral amorphous carbon. The goal of the project was to determine how the carbon electrode microstructure and method of surface pretreatment affects the response. In addition, diamond microelectrodes were fabricated and studied.

ENHANCING ANTIBIOTICS TO KILL BIOFILMS

Jacob Gibson
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 2, 1:00 PM - 2:00 PM
Poster: 16
Mentor(s): Chris Waters (MMG)

Some bacteria can adhere to a surface, such as damaged tissue or an implanted medical device, and secrete a protective extracellular matrix of proteins and polysaccharides, forming a biofilm. Bacteria in biofilms have a much higher tolerance to antibiotics and thus infections caused by bacteria in a biofilm are difficult to eradicate. The objective of this study is to find combinations of antibiotics and compounds that have a synergistic killing effect on wild type *Pseudomonas aeruginosa* biofilms, an infection common amongst cystic fibrosis patients. A large screen was performed to find possible candidates for compounds displaying synergistic effects with tobramycin; the top 6 compounds were selected for further examination. Biofilms were grown on 96-well MBEC Biofilm Inoculator plates and then transferred to another plate with the treatment for a set duration. The biofilm killing was then quantified using the Promega BacTiter-Glo Microbial Cell Viability Assay. 250ug/mL tobramycin was found to have synergistic effects and killing of over 50%, when paired with 100uM alpha-mangostin, closantel, triclosan, and galangine. 100uM triclosan was also tested for similar effects with other antibiotics: chloramphenicol, azithromycin, gentamicin, and cefoperazone; however synergistic effects were only observed when triclosan was paired with gentamicin.

REPURPOSING AN AMINOMUTASE FROM TAXUS PLANTS: STEREO- AND REGIOSELECTIVE AMINATION OF CINNAMATE EPOXIDES PRODUCES RING-OPENED *ERYTHRO*-PHENYLSERINES

Olivia Goethe
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 2, 1:00 PM - 2:00 PM
Poster: 17
Mentor(s): Edith Onyeozili (Chemistry)

After its biosynthesis, the antineoplastic, natural product paclitaxel has nineteen chiral centers. The stereochemistry of the phenylisoserine side chain of paclitaxel is important for its efficacy. The side chain is derived from R-β-phenylalanine, which is the lone product of a stereoselective aminomutase (*Tc*PAM) that uses S-α-phenylalanine as a substrate. Earlier studies showed that TcPAM functions as a transaminase and ring-opens cinnamate epoxide to an *erythro*-phenylserine. Additionally, *meta*-substituted cinnamate epoxides with bromo-, chloro-, and nitro-substituents were tested as substrates for *Tc*PAM using styrylalanine as the amino group source in the transamination reaction. LC-MS revealed masses that were predicted for aminated, ring-opened products. To solve the absolute stereochemistry of the biosynthetic phenylserines, we used the stereospecific L-threonine aldolase (from *Escherichia coli*) to assess the D- or L-stereoisomerism of the *erythro*-products. The aldolase would cleave the Cα-Cβ bond of a [2S, 3S] stereoisomer, producing benzaldehyde and glycine. Mass spectrometry will help discern which molecules are present before and after incubation with the aldolase. A reduced peak of a [2S, 3S] stereoisomer corresponding to a peak with the same retention time and fragment ions in the biosynthetic sample would suggest the absolute stereochemistry of the *erythro*-phenylserine product is [2S, 3S]. Kinetic experiments involving varying the concentrations of each epoxide with a predetermined reaction time and enzyme concentration were performed and analyzed by LC-MS for peak area of the product. The K_{cat} and K_m values obtained for each epoxide substrate will be compared to conventional substrates to find which substances react most efficiently with TcPAM.

THE EFFECT OF BIODIESEL AND DIESEL EXHAUST FUEL ON HUMAN BEAS-2B CELLS

Lindsey Whitlock
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 2, 1:00 PM - 2:00 PM
Poster: 18
Mentor(s): Ning Li (Pathology and Diagnostic Investigation)

Particulate matter (PM) consists of particles, chemicals, and metals, where diesel particulate matter from diesel engines is believed to be a major contributor to air pollution. Biodiesel fuel is a cleaner substitute for petroleum diesel because of its natural resources and its ability to reduce PM emissions. We hypothesize that because biodiesels use less toxic resources, it will have a weakened pro-inflammatory effect on human bronchial epithelial cell line (BEAS-2B). We tested emissions from a new truck equipped with a diesel particle filter and an old truck without the diesel filter where both vehicles emitted diesel and biodiesel fuel. PM2.5 (PM ≤ 2.5 μm) samples were collected on a Teflon filter and extracted with water and used to stimulate human bronchial epithelial cells (BEAS-2B). ELISA assays were performed to monitor IL-6 and IL-8 cytokines and evaluate their responses to the exposure of PM. We predict the incorporation of biological components and PM emissions will decrease the adverse effects of biodiesels on the BEAS-2B cells. Our biological findings regarding biodiesel fuel will provide a better understanding of its effects on human health and provide insight on how to develop a better biodiesel blend we could potentially inhale.

DEVELOPING ROBUST METHODS FOR RESEARCHING TRANSPORTERS IN ADIPOCYTES

Cassandra LaMarche
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 20
Mentor(s): Nadia Ayala-Lopez (Pharmacology and Toxicology), Elahé Crockett (Medicine), Stephanie Watts (Pharmacology and Toxicology)

Introduction: Norepinephrine (NE) is a neurotransmitter that can be found in perivascular adipose tissue (PVAT). NE causes blood vessel contraction, leading to an increase in blood pressure. In a previous study performed in our lab, corticosterone, a drug known to block organic cation transporter 3 (OCT-3) significantly decreased the uptake of NE in PVAT. We have also found through immunohistochemistry (IHC) and high-pressure liquid chromatography (HPLC) analyses, that NE is present in adipocytes. Hypothesis: The OCT-3 protein will be present in the adipocyte membrane and would be the primary transporter of NE into the adipocyte cells. Methods/Results: To determine if OCT-3 is present in PVAT adipocytes, we developed a novel method for adhering adipocytes to slides and are working on refining our techniques for analyzing whole PVAT and isolated PVAT adipocytes through IHC and polymerase chain reaction (PCR). Once these techniques have been optimized, we can continue moving forward in testing our hypothesis. Determining if OCT-3 is present in PVAT adipocytes is integral to the understanding of PVAT physiology and can be useful in determining drug targets in the future. Support: Cassandra LaMarche is a REPID scholar supported by an NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

ISOLATION AND CHARACTERIZATION OF THE SERINE/THREONINE KINASE DOMAIN OF THE TUDOR PROTEIN STK31/TDRD8

Gloria Calderon
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Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 21
Mentor(s): Chen Chen (Animal Science)

The Tudor family of proteins is involved in several important biological processes such as genome stability, cell division and gametogenesis. Tudor proteins are primarily expressed in the germ line and have the ability to bind methylated arginine or lysine residues in other proteins. In the germ line, they also interact with other proteins to silence genes that affect fertility. STK31 is one of the identified Tudor proteins that might affect the process of spermatogenesis. STK31 has two different active sites to modify the substrate with which they interact. One of the domains is a Tudor domain and the other is a serine/threonine kinase domain. This serine/threonine kinase domain is assumed to phosphorylate substrate. To further understand how this domain interacts with its substrate our lab will study the serine/threonine kinase domain in isolation. Vector cloning techniques will be employed to express the protein kinase domain. The expressed protein functional site will be isolated and phosphorylation will be quantified for substrates added. We anticipate that our study will investigate further the activity of the serine/threonine kinase domain for better study of the protein characterization. Since the Tudor family of proteins expressed in the testis are related with spermatogenesis, understanding how STK31 interact with other proteins is important to predict how this protein may affect or not gametogenesis.

IDENTIFICATION OF FUNCTIONAL IL-17 RECEPTORS ON HEPATOCYTES

Dominique Garrison
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 22
Mentor(s): Bryan Copple (Pharmacology & Toxicology), Elahé Crockett (Medicine)

Introduction: Cholestasis is a condition caused by drug toxicities, genetic defects, hepatic malignancy, or biliary tract obstructions. Cholestasis occurs when bile acid excretion from the liver is slowed or blocked, which leads to its accumulation in the liver, hepatic injury and inflammation. The innate immune response/inflammation is initiated during cholestasis by activation of macrophages, neutrophils, and lymphocytes. Cytokines and their receptors are key players in the development of this process during inflammation. Our previous studies demonstrated that the cytokine, Interleukin-17 (IL-17), promotes hepatic inflammation during cholestasis. However, it is not clear whether hepatocytes are a target of IL-17 and what receptor is involved. Hypothesis: Hepatocytes express the receptor for IL-17A and produce cytokines when exposed to IL-17A. Methods/Results: Multiple assays were conducted to identify whether hepatocytes express the IL-17A receptor subunits: IL-17RA and IL-17RC. Real time PCR showed that hepatocytes express the mRNAs for both IL-17RA and IL-17RC. Western blot analysis indicated the presence of IL-17RA on hepatocytes, and immunohistochemical staining of liver sections showed expression of IL-17RA and IL-17RC on hepatocytes. Treatment of mouse hepatocytes with IL-17A increased expression of the inflammatory mediator macrophage inflammatory protein-2, indicating that the IL-17 receptor is functional in hepatocytes. Conclusion: An increase in IL-17A induces hepatic inflammation leading to liver complications. Hepatocytes express the IL-17A receptor, which may be targeted therapeutically to reduce inflammation and liver injury during cholestasis. Support: D.G. is a REPID scholar with training support by NIH-5-R25-HL108864-award to Elahé Crockett, REPID-Program Director.

ROLE OF SPHINGOSINE-1-PHOSPHATE RECEPTOR-2 IN UPREGULATION OF INFLAMMATORY MEDIATORS IN HEPATOCYTES BY BILE ACIDS

Reynier Urdaneta Moreno
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 23
Mentor(s): Bryan Copple (Pharmacology and Toxicology), Elahé Crockett (Medicine)

Background: A main function of the liver is to produce bile, which helps in the digestion process. This function is carried out by hepatocytes. Cholestasis, is a disease that develops when flow of bile is interrupted. When this occurs, hepatocytes are exposed to high concentrations of bile acids, which stimulates inflammatory cytokine production. We previously showed that the signal transaction pathway Erk1/2 is activated by bile acids and is required for production of the cytokines, interleukin-23 (IL-23) and

macrophage inflammatory protein-2 (MIP-2). However, the mechanisms by which bile acid, taurocholic acid (TCA), activates Erk1/2 is not known. **Hypothesis:** Bile acids activate sphingosine-l-phosphate receptor-2 (S1PR2) which stimulates hepatocytes to produce inflammatory mediators. **Methods/Results:** Mouse hepatocytes were isolated and treated with TCA. Real-Time PCR was used to measure levels of MIP-2 and IL-23. Pretreatment of hepatocytes with the S1PR2 antagonist (JTE-013) did not prevent upregulation of MIP-2 and IL-23 by TCA. Next, it was determined whether a structurally related receptor, lysophosphatidic acid receptor-2 (LPAR2) was required for upregulation of inflammatory cytokines by TCA. Pretreatment of hepatocytes with the LPAR2 antagonist, Ki16425, partially prevented upregulation of MIP-2 and IL-23 by TCA. These results suggest that TCA upregulates MIP-2 and IL-23 in hepatocytes by activating LPAR2. **Conclusion:** Inhibition of LPAR2may lead to better treatment for patients with cholestasis by reducing the inflammatory response and liver injury. **Support:** R.U. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

AFFECTS OF SEX HORMONES ON SPONTANEOUS AUTOIMMUNE PERIPHERAL NEUROPATHY IN A WORKING MOUSE MODEL OF GUILLAIN-BARRé SYNDROME

Kenneth Jackson
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 24
Mentor(s): Linda Mansfield (Large Animal Clinical Sciences)

RATIONALE: Guillain-Barré Syndrome is an autoimmune disease in which the immune system targets gangliosides located on the surface of peripheral nerves. In Nonobese diabetic (NOD) wild type mice, testosterone has shown to be protective in the development of another autoimmune disease, diabetes. The mice did develop Spontaneous Autoimmune Peripheral Polyneuropathy (SAPP) later in life. In order to truly understand this relationship we need to study the affects of gender while measuring the testosterone and estrogen levels of the mice. We hypothesize that testosterone will be a protective factor in the development of SAPP in the working mouse models in the Mansfield lab. METHODS: Previously collected plasma samples from Cefoperazone inoculated experiments will be analyzed for testosterone and estradiol using the ELISA technique. The ELISAs will be run simultaneously to minimize variability. The findings will be correlated with known results from phenotype tests, antiganglioside ELISAs, and nerve histopathology. RESULTS: We predict that female and male mice that have shown phenotypic evidence of SAPP will have lower levels of testosterone when compared to those who did not. Furthermore, we believe that mice with low testosterone levels will have a direct correlation with abnormal phenotype test results and mild to moderate histologic alterations in the sciatic nerve. CONCLUSION: If we understand the relationship between bacteria, sex hormones, and autoimmune disease, we will be able to better understand the pathogenesis of GBS and be able to predict those that may be at a greater risk for developing the syndrome.

ISOLATION AND CHARACTERIZATION OF NOVEL THERMOPHILIC NITROGEN-FIXING MICROBES FROM CENTRALIA, PENNSYLVANIA

Saarang Gopinath
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 3, 2:00 PM - 3:00 PM
Poster: 25
Mentor(s): Maren Friesen (Plant Biology)

Fixation of atmospheric N2 into NH3 is performed exclusively by prokaryotic microbes, many of which are heterotrophs found in soil ecosystems. Typical nitrogenase enzymes are irreversibly rendered non-functional in the presence of oxygen. Here we sought to culture heterotrophic diazotrophs in the presence of oxygen to identify novel mechanisms of nitrogen fixation. To accomplish this goal, we plated soil samples on nitrogen-free media and incubated them in the presence of oxygen. We identified unique colony types that lacked standard nitrogen fixation (*nifH*) genes using a PCR-based screen. Isolates of interest will be rigorously tested for the ability to fix nitrogen and have their genomes sequenced to elucidate novel pathways for diazotrophic growth. Our initial efforts focused on soils collected from Centralia, Pennsylvania. The Centralia site was of interest to us due to the high temperatures imposed on the soil from an underground coal seam fire, which has been burning for 50 years. We therefore catered our culturing efforts to this environment by incubating soils at 55 deg. C (approximately the ground temperature during soil collection). While many other soil environments will likely be screened for novel nitrogen fixation pathways in the future, we chose to start with high temperature soils due to previous discoveries of unique nitrogen fixation systems in these environments.

GLUCOSE-INDUCED DECREASE IN MEMBRANE FLUIDITY IN RETINAL CELLS: IMPLICATIONS FOR DIABETIC RETINOPATHY

Jacob Gallimore
Home Institution: Kalamazoo College
Category & Time: Biochemistry and Microbiology, Section 4, 2:00 PM - 3:00 PM
Poster: 26
Mentor(s): Gary Blanchard (Chemistry), Julia Busik (Human Physiology), Harshini Chakravarthy (Human Physiology)

Background: The diabetic metabolic insult leading to retinal vascular degeneration is proposed to involve retinal cell damage that is then inadequately repaired due to compromised availability of circulating angiogenic cells migrate to, extravasate and home to the retinal sight of injury. Migration, extravasation and homing depend on high membrane fluidity, thus he hypothesized that decrease in membrane fluidity in diabetes could contribute to retinal damage. Methods: Human Retinal Pigment Epithelial (HRPE) cell treated with normal (5.5 mM) or high (25 mM) glucose were used as retinal cell culture model. Membrane fluidity was measured using the rotational diffusion dynamics of perylene imbedded in the cell membrane. Results: HRPE cells cultured in normal glucose

demonstrated a viscosity of 7.3 cP. Treatment with high glucose resulted in an increase in viscosity to 9.43 cP, indicating decreased membrane fluidity. Further tests are being conducted to confirm statistical significance. Conclusion: Decreased membrane fluidity could contribute to diminished retinal cell repair and pathogenesis of diabetic retinopathy.

BIOCHEMICAL VALIDATION OF CHEMERIN-9 INDUCED VASCULAR CONTRACTION

Aisha Kelly
Home Institution: Bennett College for Women
Category & Time: Biochemistry and Microbiology, Section 4, 2:00 PM - 3:00 PM
Poster: 27
Mentor(s): Stephanie Watts (Pharmacology/Toxicology)

Approximately two-thirds of U.S. adults are overweight/obese and many of these individuals have, or will develop, hypertension as a comorbid condition. Prior studies have determined that perivascular adipose tissue (PVAT) secretes chemerin, a peptide that functions as a vasoconstrictor. Chemerin initiates smooth muscle contraction by activating the GPLR Chem-23. What has yet to be identified is the biochemical process by which this vasoconstriction occurs. We hypothesized that chemerin induces contraction through the employ of procontractile signaling pathways that involve phosphorylation and activation of the enzymes PI3K, P38 MAPK, Rho Kinase, and ERK MAPK. Our model was thoracic aorta harvested from the Sprague-Dawley rat, manually cleaned of PVAT and endothelium. In isolated tissue baths, aortae were stimulated with phenylephrine (PE) to ascertain maximum contraction. They were next exposed to distilled H_2O or 1μmol of the analog chemerin-9, to stimulate contraction. Vehicle exposed samples maintained baseline levels (≈1% of PE contraction). Chemerin-9 exposed samples contracted at ≈30% of mean PE contraction. Western blot analysis will be conducted to determine phosphorylation levels of the targeted enzymes after vehicle or chemerin-9 was introduced. We predict the chemerin-9 exposed samples will reveal increased phosphorylation of P38 MAPK, PI3K, and Rho Kinase with no change in the phosphorylation levels of ERK MAPK. No increased phosphorylation of targeted enzymes in vehicle-exposed samples is expected. Enzymes that experience increased phosphorylation and activation after chemerin-9 exposure will identify the signaling pathways for chemerin-induced smooth muscle contraction. Pinpointing this pathway establishes a biochemical link between obesity and hypertension and has potential for significant pharmacological application in treating and preventing hypertension.

NOCODAZOLE'S AFFECT ON AXONAL ELONGATION IN CHICKEN DRG NEURONS

Lucas Fix
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Category & Time: Biochemistry and Microbiology, Section 4, 2:00 PM - 3:00 PM
Poster: 28
Mentor(s): Kyle Miller (Zoology)

Manipulation of neuronal axon elongation has been indicated as a potential treatment for the remediation of nerve damage and diseases such as Alzheimer's. The traditional model for growth cone-mediated neuronal elongation views polymerization of actin and tubulin subunits at the tip of the axon as the main forces at work. Recent work suggests both axons and the growth cone also generate forces through cytoskeletal dynamics, kinesin, dynein, and myosin to induce axonal elongation. For this study embryonic chick dorsal root ganglion were collected after 10-12 days of incubation to provide healthy growing neurons. The cells are cultured from eggs acquired from Meijer. They are grown on poly-L-ornithine for optimum growth, along with a nerve growth factor, and red-fluorescent mitochondrial tracking stain in order to visualize transport including microtubule docked mitochondria within the axon. From there the rate of growth or retraction (m/hr) was recorded at different points along the axon. Since microtubules advance growth of the axon through polymerization we use Nocodazole, a known microtubule depolarizer, to see how the remaining contraction force from actin and myosin II motors effect the length of the axon. The growth cone was shown to retract due to actin's ability to create tension. Yet docked mitochondria in close proximity to the cell body continued to show advancement. Growth is still occurring and this shows that the process of depolymerization occurs at the growth cone and proceeds toward the cell body.

GLUCOSE-6-PHOSPHATE TRANSPORT ACROSS THE CHLOROPLAST MEMBRANE

Cosette M. Rivera-Cruz
Home Institution: University of Puerto Rico at Cayey
Category & Time: Biochemistry and Microbiology, Section 4, 2:00 PM - 3:00 PM
Poster: 29
Mentor(s): Thomas Sharkey (Biochemistry and Microbiology), Sean Weise (Biochemistry and Microbiology)

In plants, photosynthesis occurs in the chloroplasts during the day to produce sucrose and starch. Sucrose is exported to other parts of the plant that cannot do photosynthesis, while starch is accumulated in the chloroplast to be broken down and used at night. The formation of sucrose from the hydrolytic breakdown of starch uses a hexokinase in the cytosol which consumes energy in the form of ATP, this step could be bypassed if hexose phosphate was exported from the chloroplast. Arabidopsis has two hexose phosphate antiporters specific for glucose-6-phosphate (G6P): GPT1, which is only expressed during gametophyte development, and GPT2, which is normally only expressed in amyloplasts and not in autotrophic green chloroplasts. Transgenic lines of Arabidopsis thaliana that overexpress the GPT2 antiporter were generated. When plants were grown in low light (30 $\mu molm^{-2}s^{-1}$), they were similar to the wild type. However, when plants were exposed to high light (130 $\mu molm^{-2}s^{-1}$) the GPT2 overexpressing plants accumulated higher amounts of anthocyanin and had altered starch and sugar amounts. We conclude that G6P is imported into the chloroplast during the day and exported at night in GPT2 overexpressing plants.

EFFECTS OF THE AHR POLYMORPHISMS ON HUMAN B LYMPHOCYTE SENSITIVITY TO TCDD-INDUCED SUPPRESSION OF IGM SECRETION

Oluwaseun Aluko
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 4, 2:00 PM - 3:00 PM
Poster: 30
Mentor(s): Norbert Kaminski (Center for Integrative Toxicology)

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is a by-product of industrial processes like incomplete combustion of fossil fuels. TCDD is a ligand for the Aryl Hydrocarbon Receptor (AHR), which mediates many TCDD-induced toxicities by altering gene expression. Recent studies have shown that B lymphocyte is a target of TCDD. TCDD suppress B cell activation and IgM secretion in humans. Interestingly, there is a level of variability in sensitivity to TCDD-induced suppression of the IgM response. AHR SNPs have been shown to alter sensitivity to TCDD in mouse/rat models. Sequencing of donors that show no sensitivity to TCDD identified different SNPs within the AHR. Therefore, we hypothesized that some of the variability in sensitivity to TCDD-induced suppression of the IgM response is due to SNPs within the AHR. The AHR null SKW 6.4 human B cell line will be used to establish SKW-AHR+ cell lines that express the wild type or polymorphic form of the human AHR. Generated cell lines will be assayed for sensitivity to TCDD. A control will be performed with a lentiviral transfection on the AHR null SKW6.4 cell line and a second cell line, the E8 cell line. TCDD will then be applied to the cells post transfection and a luciferase assay will be done to measure AHR activation. The E8 cell line, which expresses the AHR, will have a higher AHR activation. Understanding the relationship between AHR polymorphisms and sensitivity to TCDD-induced biological activity in the human B cell will help to identify the level of individual susceptibility to xenobiotic-induced toxicity.

OBSERVING THE EFFECTS OF PH ON SYNTHESIZED PHOSPHOLIPID BILAYERS

James Martin
Home Institution: State University of New York Buffalo
Category & Time: Biochemistry and Microbiology, Section 5, 3:00 PM - 4:00 PM
Poster: 32
Mentor(s): Gary Blanchard (Chemistry)

Our cells are protected by a barrier called the plasma membrane, which is composed of a phospholipid bilayer and mediates the influx/out-flux of molecules. Phospholipid bilayer research is a growing field, with one goal being to build biomimetic systems where transmembrane proteins and other molecules can be inserted and studied. Bilayer fluidity and structural properties depend on the aqueous over-layer; in this study we control the overlayer's pH. Although human blood plasma has a pH of ~ 7.4, varying the model bilayer system's pH is useful because of its effect on bilayer organization. It is expected that changes in overlayer pH will influence a phospholipid bilayers organization. This project aims to construct a planar phospholipid bilayer containing phosphocholine 1,2-dioleoyl-sn-phosphatidylcholine (DOPC), cholesterol, sphingomyelin and sulforhodamine-tagged-1,2-dioleoyl-sn-phosphatidylethanolamine (SR-DOPE), on a mica surface. Overlayer solutions in the pH range of 4-10 were made from hydrochloric acid (HCl) and sodium hydroxide (NaOH) and were applied to each synthesized bilayer. Each bilayer / pH combination was examined for organizational changes using optical microscopy. Lower pH's tended to induce bilayer instability, consistent with headgroup electrostatic repulsion since phosphocholine is zwitterionic near neutral pH and cationic at low pH. Tests with an oppositely charged membrane, containing phosphoglycerol, complement the phosphocholine results and indicate the extent to which the bilayers structure depends on the membrane's net charge. Once the pH dependence is established, the local organization of the membrane will be probed using picosecond laser fluorescence imaging measurements, thereby relating macroscopic organizational changes to molecular scale order.

SYNTHETIC BIOLOGY APPROACH TO MODIFY AND EXPRESS BACTERIAL MICRO-COMPARTMENTS INTO HETEROLOGOUS SYSTEMS

Clara Cruet-Burgos
Home Institution: University of Puerto Rico at Mayaguez
Category & Time: Biochemistry and Microbiology, Section 5, 3:00 PM - 4:00 PM
Poster: 33
Mentor(s): Raul Gonzales-Esquer (Plant Sciences)

Cyanobacteria are photosynthetic microorganisms that play an important role in the planet's primary production. Recently, they have been proposed as renewable production "microfactories" because of their amenability to genetic engineering, their fully sequenced genomes and because they do not compete for arable land. Opposed to plants, cyanobacteria fix carbon dioxide in the carboxysome, a protein based organelle that encapsulates the enzymes RuBisCO and carbonic anhydrase. The carboxysome shell concentrates carbon dioxide inside this compartment and keeps out the competing substrate oxygen, therefore increasing the efficiency of the carboxylase activity of RuBisCO. Our projects seek a better understanding of the structure and organization of carboxysomes. First, variants of the carboxysomal shell protein CcmO will be expressed in E. coli, purified by FPLC, crystallized and its structure will be determined. Second, different sets of carboxysomal proteins will be expressed in the heterologous host E. coli to determine the minimum protein units required for a pseudo-carboxysome formation. Successful assembly will be analyzed by transmission electron microscopy and FPLC/Western Blot. We envision that this research could be a step into the incorporation of carboxysomes into diverse applications. In the industrial sector they could be used to encapsulate toxic or valuable compounds during fermentations; they could be used as well for protein scaffolds, biofuel production, etc. In agriculture they may represent a new tool to achieve food security by decreasing photorespiration of plants, which may result in higher yields.

INDUCED MUTATIONS IN PROTEINS TO CONTROL FOLDING PATHWAYS
Eboney Stallworth
Home Institution: Alabama A&M University
Category & Time: Biochemistry and Microbiology, Section 5, 3:00 PM - 4:00 PM
Poster: 34
Mentor(s): James Gieger (Chemistry)

Dimerization is a process by which two monomeric molecules bond together to form larger structures. Domain swapping is a form of protein folding where identical secondary structures swap domains, due to non-covalent interactions and conformational strain, in order to form a larger primary structure. The resulting primary structure can actually be a dimer, trimer, or etcetera. In this case we are studying the phenomenon in regards to dimerization. Dimerization is the form of protein folding where there is a cleavage of non-covalent interactions of one monomer with the identical domain of another monomer. This leads to a cross-swapping of domains, forming a dimer of the monomers. Domain swapping is a possible mechanism for protein aggregation. Protein mis-folding and aggregation can lead to various diseases like Alzheimer's. In this study, we will induce mutations in the hinge loop region of Human Cellular Retinol Binding Protein II to increase conformational strain in a short loop between two beta strands, which causes domain-swapping dimerization. The overall goals are to understand how to control domain swapping in order to form dimers. Crystal structures of the monomeric and domain-swapped species will provide essential information in this process. Methodologies include the following: Polymerase Chain Reaction (PCR) "Quick Change" mutagenesis, DNA agarose gel electrophoresis, Mini-Prep DNA and protein purification, and protein crystallization and structural analysis.

THE ROLE OF EDEM1 IN VIRAL ENVELOPE DEGRADATION IN HEK293T CELLS
Victoreea Harris
Home Institution: Jackson State University
Category & Time: Biochemistry and Microbiology, Section 5, 3:00 PM - 4:00 PM
Poster: 35
Mentor(s): Dylan Frabutt (Microbiology and Molecular Genetics), Yong-Hui Zheng (Microbiology and Molecular Genetics)

ER stress in host cells preceding the ER associated degradation (ERAD) pathway are commonly caused by viral infections. The stressed ER identifies abnormal proteins and directs them through the ERAD pathway to be ubiquinated and degraded via the 26S proteasome system. Molecular chaperones Calnexin/calreticulin (CNX/CNR) enable immature glycoproteins to achieve their native conformation. Once unfolded, proteins are then sent to the Golgi for glycan processing. HIV-1 depends upon its viral envelope glycoprotein to bind to and infect target cells. HIV-1 envelope glycoproteins gp120 and gp41 are ERAD substrates, thus must pass through the ERAD successfully. This is reached as gp120 and gp41 are extracted from CNX/CRT and are exposed by EDEM1 and ERMan1, alpha 1,2 mannosidases. ERMan1 removes mannose from the glycoproteins, targeting them for degradation. When ERMan1 is cotransfected into HEK 293T cells with the HIV-1 expression construct PNL 4-3, the envelope proteins, (gp120 and gp41) are nearly undetectable via western blotting of cell lysates. Our research explores if there is a role of EDEM1 in the observed envelope degradation phenotype displayed by ERMan1, as both mannosidases play a major role in protein degradation. To investigate the overexpression of ERMan1, CRISPR Cas9 and a specific gene in EDEM1 will target the DNA break location in the transfected HEK293T cells. A Western blot will determine if the envelope degradation phenotype persists or subsides by the knocking out the EDEM1 gene.

THE EFFECT OF FUNCTIONAL COMPENSATION AMONG BRANCHED-CHAIN AMINO ACIDS
Harry Ashbaugh
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 5, 3:00 PM - 4:00 PM
Poster: 36
Mentor(s): Cheng Peng (Biochemistry)

The branched-chain amino acids (BCAAs) leucine, isoleucine, and valine are three of the nine essential amino acids, which are not synthesized in animals, and need to be obtained from plants. Despite the fact that the synthesis of these amino acids in plants is a fairly well understood process, the catabolism (breakdown) is not. It is hypothesized that the degradation of BCAAs within Arabidopsis thaliana shares two enzymes in the first two steps, while the later steps utilize different enzymes. The genes encoding putative enzymes in the first two steps have been identified and confirmed. Four of these genes have duplicates and their transcriptional regulation has yet to be studied. Deletion of a duplicate gene tends to alter the phenotype less severely than when a single gene is deleted. This is thought to be because the remaining gene will over-express to compensate for the lost gene. In this project we employ real-time quantitative polymerase chain reaction (qPCR) to analyze the transcript levels of duplicate genes in BCAA catabolic single mutants to look for evidence of compensation.

CONTRIBUTION OF NICOTINIC ACETYLCHOLINE RECEPTORS TO METHYLMERCURY (MEHG)-INDUCED CYTOTOXICITY IN PC12 CELLS
Ellysa Vogt
Home Institution: St. Mary's University
Category & Time: Biochemistry and Microbiology, Section 6, 3:00 PM - 4:00 PM
Poster: 38
Mentor(s): Monica Rios (Pharmacology and Toxicology)

MeHg is a wide-spread environmental contaminant that is of great health concern to populations whose diets depend on seafood. In high concentrations MeHg can target a plethora of receptors in the peripheral and central nervous system. Cellular toxicity by MeHg causes disruption of synaptic communication, unsettling of cation homeostasis (commonly Ca^{2+}) and ultimately, promotes cell death. Under normal conditions, PC12 cells behave like adrenal chromaffin cells but when differentiated they provide an excellent model for neurobiological studies. Exposed to nerve growth factor (NGF) they resemble sympathetic nerve cells and express cholinergic receptors. In this study we want to determine the contribution of the nicotinic acetylcholine receptor (nAChR) in the process of MeHg- induced Ca^{2+} dysregulation and subsequent cell death. After cell differentiation, PC12 cells were exposed for 1hr to 1, 2, and 5μM MeHg. With fluorescence imaging we can examine acute and delayed MeHg-induced cell loss using the viability technique. This protocol allows MeHg-treated cells to be quantitatively identified with acridine orange and propidium iodide dyes to stain either live or dead cells, respectively. Furthermore, MeHg-treated cells exposed to the specific α7 antagonist, methyllycaconitine (MLA), allow examining the contribution of the specific α7 nAChR subtype. This antagonist should offer protection from the MeHg-induced cell death. We hypothesize that differentiated PC12 cells exposed to the MeHg treatment will cause cell death in a concentration- and time-dependent manner and that MLA exposure will protect the cells from MeHg-induced cytotoxicity.

METABOLIC FEEDBACK REGULATION OF CHLOROPLAST ATP SYNTHASE

Levi Bauer
Home Institution: Grand Valley State University
Category & Time: Biochemistry and Microbiology, Section 6, 3:00 PM - 4:00 PM
Poster: 39
Mentor(s): Geoffry Davis (Cell and Molecular Biology, PRL), David Kramer (MSU DOE-PRL)

The light reactions and carbon fixation reactions of photosynthesis require an integrated and tunable system of regulation for responses to dynamic environments. Proton deposition into the thylakoid lumen is coupled to both linear and cyclic electron flow to generate a proton motive force. These protons exit the lumen via the ATP synthase, providing energy to produce stromal ATP from ADP + P_i. This ATP is used to fix CO_2 in the Calvin Benson Bassham Cycle (CBB), ultimately providing the plant with organic carbon sources. Under CO_2 limiting conditions, a reduction occurs in the conductivity of ATP synthase, which creates a buildup of protons within the lumen that activates pH-dependent quenching (Kanazawa and Kramer PNAS. 99: 12789-94, 2002). The connecting factor between diminished activity at CBB, due to CO_2 limitation, and decreased ATP synthase conductivity is suspected to be metabolic feedback limitation. Arabidopsis thaliana chloroplast ATP synthase γ-subunit mutants were used to better understand this regulation; they possess known differences in ATP synthase conductivity at ambient CO_2 compared to wild-type. A similar down-regulation due to different CO_2 concentrations between mutants and wild-type suggests that feedback regulation remains unimpaired; differing responses imply different regulation or that ambient conductivity changes pre-alter carbon utilization. Preliminary results suggest that all of the mutants and wild-type exhibit similar down-regulation of ATP synthase activity during CO_2 changes. This supports the current model of feedback limitation, requiring further investigation into how metabolic demands lead to ATP synthase regulation.

CONTRIBUTION OF MUSCARINIC ACETYLCHOLINE RECEPTORS TO METHYLMERCURY (MEHG)-INDUCED CYTOTOXICITY IN PC12 CELLS

Lizbeth Perez
Home Institution: University of Puerto Rico at Cayey
Category & Time: Biochemistry and Microbiology, Section 6, 3:00 PM - 4:00 PM
Poster: 40
Mentor(s): Monica Rios (Pharmacology and Toxicology)

MeHg is a contemporary concern which affects fish-eating populations. Consumption of contaminated fish causes symptoms such as motor discoordination and peripheral vision loss. MeHg has high affinity to sulfhydryl and thiol groups allowing it to target many receptors and interrupt their normal behavior. This neurotoxicant alters membrane permeability, induces oxidative stress and promotes mitochondrial dysfunction. Calcium homeostasis alteration and excessive internal calcium increase leads to neurotoxicity and subsequent cell death. PC12 cells are a clonal cell line derived from a pheochromocytoma of the rat adrenal medulla. When the cells are cultured in the presence of nerve growth factor (NGF) they differentiate to resemble a sympathetic neuron physiologically, biochemically and functionally. Differentiated PC12 cells express the muscarinic (mAChR) and nicotinic acetylcholine receptors. This cell line provides a good model to study to the contribution of the mAChR, specifically the M1 and M2 subtypes, involved in MeHg toxicity. The viability protocol was performed to study the acute and delayed effects after cell exposure to 1, 2 and 5μM MeHg for 1 hr. The cellometer system stains dead and live cells depending if the membrane is or not compromised, respectively. Furthermore, the role that mAChR play in MeHg-induced calcium increases will be addressed using pharmacologic tools. The M1 and M2 specific antagonist, pirenzepine and methoctramine, provide an approach to determine the specificity of MeHg to these receptors. We hypothesize that differentiated PC12 cells exposed to MeHg will show a concentration- and time-dependent cytotoxicity which will be reduced in the presence of the antagonists.

AFFECTS OF ANISOTROPY ON SCHWANN CELL MIGRATION

Jeremy Kray, Victoria Toomajian
Home Institution: Michigan State University
Category & Time: Biochemistry and Microbiology, Section 6, 3:00 PM - 4:00 PM
Poster: 41
Mentor(s): Christina Chan (Chemical Engineering and Materials Science), Chun Liu (Chemical Engineering and Materials Science)

Spinal cord injury (SCI) and functional recovery is a major challenge in neural regeneration, with axon regeneration and myelination important aspects to functional recovery in SCI. In SCI repair Schwann cells migrate into the injured site to remyelinate the regenerated axons. Myelination forms an insulating outer layer on the axons and aid in signal transmission recovery. Currently, our lab is focusing on the migration of Schwann cells. It has been found that anisotropy, i.e. material properties that are directionally dependent, affects Schwann cell migration. To analyze this effect, we made surfaces with different sizes of channels to induce different levels of anisotropy. We then calculated the migration velocities in each set of channels and found that the cells migrate faster in smaller channels due to their higher level of anisotropy.

EFFECTS OF OBESITY ON EXCITATORY CHOLINERGIC NEURONS IN THE MYENTERIC PLEXUS OF MOUSE DISTAL COLON

Keila Mestey
Home Institution: University of Puerto Rico at Cayey
Category & Time: Biochemistry and Microbiology, Section 6, 3:00 PM - 4:00 PM
Poster: 42
Mentor(s): James Galligan (Pharmacology and Toxicology)

The gastrointestinal (GI) tract is a long tube that is responsible for the absorption of nutrients, digestion and expelling of wastes. The GI tract houses a division of the autonomic nervous system called the enteric nervous system (ENS). The ENS is arranged in two plexuses: the submucosa plexus and myenteric plexus. Submucosa plexus controls GI secretion, blood flow and absorption. Myenteric plexus contains excitatory and inhibitory motor neurons that work to produce GI motility. If the balance of these neurotransmitters is altered, certain GI motility disorders may appear causing damages to health. The objective is to find the effects of a high fat diet-induced obesity (DIO) on excitatory cholinergic neurons in the myenteric plexus in the mouse distal colon. In order to find these effects the Immunohistochemistry (IHC) technique was used. IHC technique involves the use of primary and secondary antibodies. In the project, the antibodies ChAT and Hu c/d play an important role. To the Hu c/d primary, the secondary that joins is streptavidine, and the sheep anti ChAT primary is joined by the donkey anti sheep secondary. The primary binds to an antigen, and a labeled secondary antibody binds to the primary antibody. The label is then used to indirectly detect the antigen and finally identify body cells. At the end it's expected to prove the hypothesis which establishes that obesity causes a decrease of motor neuronal population in the myenteric plexus and this is due to lose of cholinergic neurons.

BIOSYSTEMS & AGRICULTURAL ENGINEERING

EXTRACTION OF MYCOBACTERIUM SMEGMATIS BACTERIA FROM ARTIFICIAL SPUTUM SAMPLES USING MAGNETIC NANOPARTICLES

Shaurya Srivastava
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 44
Mentor(s): Evangelyn Alocilja (Biosystems and Agricultural Engineering), Patrick Fewins (Biosystems and Agricultural Engineering)

Current methods used to detect *Mycobacterium tuberculosis* from patients in underdeveloped countries are inefficient. Smear microscopy has been the standard method used to detect *M. tuberculosis*. However, at times, smear microscopy is ineffective due to lack of sensitivity and failure in preparing the smear microscopy samples. Non obvious results from smear microscopy can put analysts into a state of confusion regarding a patient's diagnosis. However, Gene Xpert, a more advanced machine to detect *M. tuberculosis* bacteria in samples is being implemented throughout the world for use. However, tests run by Gene Xpert require expensive resources and costs that research labs in underdeveloped countries cannot afford to pay. As a result, it is imperative that a rapid, cost effective, and more efficient method to detect M. tuberculosis be created to aid in the diagnosis of the growing number of tuberculosis patients in underdeveloped countries. In this study, we used *Mycobacterium smegmatis*, a non-pathogenic bacteria, as a surrogate of the pathogenic *Mycobacterium tuberculosis. M. smegmatis* is extracted from an artificial sputum using a polymer-coated magnetic nanoparticles. We verify the extraction using smear microscopy, total genomic DNA, and culture. The extraction method is expected to be fast, cost-effective, simple, and efficient alternative to current approaches.

SYNTHESIS AND CHARACTERIZATION OF MAGNETIC NANOPARTICLES FOR EVENTUAL USE IN BACTERIAL EXTRACTION

Monica Setien-Grafals
Home Institution: Syracuse University
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 45
Mentor(s): Evangelyn Alocilja (Biosystems & Agricultural Engineering), Patrick Fewinspa (Biosystems & Agricultural Engineering)

Mycobacterium tuberculosis (Mtb) is the causative agent of tuberculosis (TB), a bacterial disease that mostly affects the lungs. TB has infected around 8.6 million people in the world in 2012. Many were not correctly diagnosed due to the difficulty of its diagnosis. There has been a lot of interest regarding the synthesis of nanostructured materials because of their many possible applications in science and engineering particularly in disease diagnosis. In this project, we are synthesizing apoferritin encapsulated magnetic nanoparticles and polyaniline (PANI) on Fe3O4 magnetic particles which could be later used in the extraction of Mtb from a patient's sputum or other clinical sample. We will present the synthesis of the magnetic nanoparticles and their encapsulation in apoferritin and the synthesis of PANI on Fe3O4 coated particles. We will characterize the nanoparticles in terms of size, strength of attraction and electrochemical signals. Success of this project could improve the diagnostic efficiency of the conventional methods being used at the moment for Mtb.

AIR EMISSIONS AT AAQRF
Andrew Stoffel
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 46
Mentor(s): Wendy Powers (Animal Science)

Air Emissions from livestock is a continuous problem, including concerns about greenhouse gases and global warming. At the Animal Air Quality Research Facility (AAQRF) at Michigan State University research examines the air emissions produced from livestock based on different diets and post-excretion practices. Measured emissions include methane, hydrogen sulfide, ammonia, and non-methane total hydrocarbons produced. The nutrient flow of the entire farm system (ie., N2, NOx, N2O, NH3) is an important aspect of all farms. Understanding nutrient flow of the farm can lessen the impact of environmental burdens associated with excess nutrients present. Without nutrient reduction and management strategies, the surrounding environments could be impacted greatly. The potential for acidification, eutrophication, and global warming increases exponentially. Post-excretion strategies presently studied include a vegetative buffer to reduce volatile organic compounds (VOCs) and control odors emitted from animal housing. By identifying effective diets and post excretion strategies greenhouse gases and other emissions produced by livestock can be reduced to relieve the environmental concerns in agriculture communities.

USE OF SANDWICHED HYBRIDIZATION FOR THE DETECTION OF PATHOGEN DNA BY BIOSENSORS
Matthew Vasher
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 47
Mentor(s): Evangelyn Alocilja (Biosystems and Agricultural Engineering)

The development of a device for the rapid and economical detection of trace amounts of pathogens has important medical, agricultural, and forensic applications. In this experiment, biosensors were used to detect several pathogens at low concentrations by utilizing sandwiched hybridization. Sandwiched hybridization involves denaturing a sample of the pathogen's disease-causing gene and annealing with two complementary DNA probes to form a hybrid with PANI (polyaniline-modified electrically active magnetic nanoparticle) on one end and biotin on the other. Several washings by magnetic separation were performed to remove unbound DNA and biotin. SPCEs (screen printed carbon electrodes) were modified with streptavidin and functioned as the biosensors. After the sample was added to the SPCE, biotin-avidin bonds allowed the hybrids (and therefore, PANI) to remain on the SPCE after a light rinsing. The current was measured using a potentiostat, and cyclic voltammetry revealed the sample's detectability and redox properties. The results showed a notable difference depending on the pathogen DNA's presence, revealing this technique's potential as a viable detection method. Future experiments will involve the use of gold nanoparticles and alternate washing methods to improve biosensor sensitivity. This information can be applied to the development of an affordable, easy-to-use biosensor for the early detection of pathogens and possibly the detection of anything with DNA. This, in turn, will lead to earlier diagnosis of diseases, safer food, decreased crop death, and greater biosecurity.

A LIFE-CYCLE ASSESSMENT COMPARING SOYBEAN ROTATION METHODS AND TILLING MANAGEMENT
Xuhao Dai
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 48
Mentor(s): Christopher Saffron (Biosystems and Agricultural Engineering)

Carbon dioxide, methane and nitrous oxide are greenhouse gases that cause global climate change. Cultivation of corn contributes to climate change through fertilizer manufacture, combustion in farming equipment and nitrous oxide release from soils. Rotation of corn with soybeans has proven to reduce greenhouse gas emissions as soybeans fix nitrogen, which reduces the amount of fertilizer needed by corn. On the other hand, corn is capable of increasing the amount of soil organic carbon, which benefits soybean cultivation. In order to quantify the positive impacts of different rotation methods, standard life-cycle assessment was used to conduct a cradle-to-grave analysis of the cultivation process. In addition to different crop rotations, greenhouse gas emissions in cultivation activities can be highly affected by tillage practices. A comparison of greenhouse gas emission between no till practice and conventional till practice was another important component of this project. The amount of greenhouse gas emissions was converted to an equivalent amount of cars that could be either removed or added to the road.

EFFECTIVENESS OF WETLAND PLANTS IN TREATING TILE DRAINAGE IN A TWO-STAGE DITCH SYSTEM
Tessa Clarizio
Home Institution: University of Notre Dame
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 50
Mentor(s): Dawn Reinhold (Biosystems and Agricultural Engineering)

This project examines how effective different types of wetland plants are in removing nutrients from tile drain effluent. Tile drains, a means of subsurface drainage in agriculture, are used throughout the Midwest to optimize the growing conditions of a field. This resource gives farmers a relatively low cost and low maintenance method for regulating drainage in their fields, and reduces surface runoff. However, due to the high nutrient concentration in the soil from fertilizer application, tile drainage contains nitrates,

phosphates, and other chemicals that could cause adverse environmental consequences, such as hypoxia in the Gulf of Mexico (A.M. Lemke, 2011). Best Management Practices (BMPs) are ways through which tile drainage is treated most effectively. One BMP is a two-stage ditch, in which there is a main channel through which the water flows, and "benches" on each side, creating a floodplain where plants can grow. In this project, eight boxes were constructed to simulate two-stage ditch conditions, each holding a plant mixture. The mixtures tested included: a control, a nutrient retention mixture, a high biomass mixture, and a commercial mixture, with duplicates of each. Each week, the effluent from the boxes was tested for nitrate, phosphate, total nitrogen, and total phosphorus using ion chromatography. Results are expected to indicate which plant types or mixtures are best suited to treat pollutants from tile drainage.

ANALYSIS OF GREEN DIESEL FUEL PRODUCTION USING PYROLYSIS-ELECTROCATALYSIS DEPOTS AND CENTRALIZED REFINING

Nichole Erickson
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 51
Mentor(s): Christopher Saffron (Biosystems and Agricultural Engineering)

Carbon and energy efficient methods for producing liquid hydrocarbon fuels are needed to maximize the amount of energy that can be gained from a limited amount of plant biomass. Decentralized approaches, such as pyrolysis to make bio-oil, a liquid fuel intermediate, need to be designed to harness America's diffuse biomass resource. For pyrolysis to be adopted in small-scale "depots," the undesired properties of bio-oil must be assuaged prior to transport to a centralized finishing refinery. Chemical reduction using electrocatalysis, a novel method developed at MSU, is the keystone of this approach as it chemically stabilizes bio-oil to a storable and transportable form. This poster details such a decentralized stabilization process and subsequent upgrading by centralized refineries that offer hydroprocessing technology. The aim of this study is to benchmark the efficiency of this proposed process vs. a simpler version that consists of a single hydrotreater. To levelize comparison between these scenarios, a functional unit of 100 million gallons of dodecane (C12H26) was selected for this study, as dodecane is an adequate surrogate for diesel fuel. Using the proposed approach, a decrease in capital cost, product cost, feedstock requirements, environmental impacts, and external hydrogen is expected.

FAST PYROLYSIS AND ELECTROCATALYSIS FOR CONVERSION OF BIOMASS INTO A RENEWABLE ENERGY

Aaron Gordon
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 52
Mentor(s): Mahlet Garedew (Chemical Engineering and Materials Science), Chris Saffron (Biosystems & Agricultural Engineering)

In recent years there has been a push to find sources of renewable energy in order to address global energy issues due to depletion of fossil fuels and combat the degradation of the environment. One solution lies in the conversion of lignin based biomass into liquid fuels. We want to know if pyrolysis and our version of Electrocatalytic Hydrogenation (ECH) can be used to convert biomass into a stable form of bio-oil. Fast pyrolysis is one method whereby heat is used in the absence of oxygen to convert biomass into char (solid form), gas and bio-oil (liquid form). The product of greatest value is the bio-oil which has the potential to be used as a renewable energy source. Unfortunately, bio-oil has undesirable properties such as low energy content compared to gasoline, its reactivity in storage, low pH resulting in the corrosion of metals. Despite this we believe that our catalyst combined with the right conditions will produce a stable bio-oil. The bio-oil must be stabilized through ECH. ECH is a process where hydrogen is used to hydrogenate and deoxygenate the compounds in bio-oil in an effort to stabilize them and increase overall energy content. This study focuses on the potential of lignin as material for fast pyrolysis. Lignin, a component of biomass, has great potential as it accounts for up to 40% weight and 40% of energy in biomass. ECH has the potential to improve the properties of lignin-derived bio-oil and create a product of higher energy and economic value. Thus far we have been able to breakdown, but not completely, some of the main bio-oil compounds.

NUTRIENTS REMOVAL AND WATER RECLAMATION OF ANAEROBIC DIGESTION (AD) EFFLUENT VIA ELECTROCOAGULATION (EC) TECHNOLOGY

Charles Sanders
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 53
Mentor(s): Wei Liao (Biosystems and Agricultural Engineering), Zhiguo Liu (Biosystems and Agricultural Engineering)

This project embodies the evaluation and optimization of electrocoagulation as a treatment of anaerobic digestion (AD) effluent. During the anaerobic digestion process, various anaerobic microbes are working systematically to break down organic waste and utilize carbon in the waste for biogas (methane) production. It is a practical and widely used approach to treat agricultural waste. However, AD has poor performance on nutrients (phosphorus and nitrogen) utilization. Without proper downstream process, the nutrient rich liquid digestate is still an environmental liability. Electrocoagulation (EC) is an electrically mediated chemical-free coagulating process. During EC treatment, neutralization of negative charges present on the surface of solid particles in a liquid medium causes aggregation around the metal hydroxide coagulants from the oxidization of the electrified metal anodes, which leads to separation of the particle clusters from the medium. The optimization of EC entails maximizing the efficiency of removing chemical oxygen demand (COD) and total phosphorus (TP), which are associated with the accumulation of solid particles during EC treatment. A scaled-up column EC reactor was developed and constructed based on previous studies. The effects of the initial total solid (TS) level, retention time, current density and the anode connection patterns were evaluated and optimized in this study to

maximize removal of the pollutants of TP and COD. This study would not only explore new relationships of EC parameters, but also provide a valuable evaluation of scalability of EC treatment on AD effluent.

ECONOMIC AND ENVIRONMENTAL VIABILITY OF CO-DIGESTION OF MUNICIPAL BIOSOLIDS AND FOOD WASTE IN ANAEROBIC DIGESTION

Alex Vincent
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 54
Mentor(s): Steven Safferman (Biosystems and Agricultural Engineering)

Treatment of raw biosolids in a wastewater treatment process can be up to 50% of operational expenses. In order to treat biosolids, it must be dewatered and have a reduction of pathogenic activity. Typically, the final product is given to the agriculture industry as fertilizer, sent to a landfill, or incinerated. Anaerobic digestion of biosolids is a more attractive option, as it reduces volume of biosolids, pathogenic activity, and produces methane gas used for electricity and heating. Recent research has shown that blending feedstocks from different sources of waste has the potential to improve methane yields and divert food waste from sewers and landfills. Our research looks at a holistic view of blending biosolids and food waste at a municipal wastewater treatment plant, focusing on the viability of anaerobic digesting in regard to economics and greenhouse gas emissions.

A WATER CURTAIN-ALGAE CULTURE SYSTEM TO MITIGATE AIR EMISSIONS FROM ANIMAL FEEDING OPERATIONS TO YIELD VALUE-ADDED PRODUCTS - A PILOT SCALE STUDY

Kyle Nussdorfer
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 56
Mentor(s): Qianfeng Li (Biosystems & Agricultural Engineering)

Air emissions from Animal Feeding Operations (AFOs) have potentially negative impacts on human and animal health along with our ecosystem. New air emission mitigation technologies, that are both economically and technologically feasible, are in high demand to sustain future animal agriculture. In this pilot study, we improved our lab scale Water Curtain Suspended Algae (WCSA) system design, and collected data for future full-scale applications. The WCSA system includes a water curtain, a suspended algae reactor, and an exhaust air blower system. The water curtain was formed by continuously pumping water into a perforated water tank that flowed into an open raceway algae. The exhaust particles are then captured and pollutant gases are dissolved or absorbed into the water droplets. Local freshwater algae species “Desmodesmus” was cultured to recycle nutrients and assist in the water reclamation. We monitored daily the air emission mitigation performance, the water nutrient level, and the algae growth performance. Preliminary results of the ongoing project have shown around a 50% NH_3 reduction. Algae concentrations of up to 0.8 g/L were harvested using an acid treatment, the natural settling process, and a centrifuge. Harvested algae will be evaluated as an animal feed additive in order to create a self-sustainable system. The adoption of this new technology will reduce the environmental impact and create new jobs for future animal agriculture.

EVALUATION OF DIFFERENT FUNGAL LIPID EXTRACTION METHODS

Austin Mashburn
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 57
Mentor(s): Wei Liao (Biosystems and Agriculture Engineering), Yingkui Zhong (Biosystems and Agriculture Engineering)

In response to rapid expansion of biodiesel demand, the current interest of biodiesel research and development has been diverted to heterotrophic oleaginous microbes such as bacteria, yeasts and filamentous fungi that have characteristics of fast growth rate, relatively simple production process, and easy scale-up. The lipid content in oleaginous fungi ranges from 21% to 74%, which is also comparable to most oleaginous yeasts and microalgae. Since lipid extractions one of the key steps in microbial biodiesel conversion, understanding its effects on fungal lipids could make a major contribution towards a fungi-based biodiesel production. However, optimization of fungal lipid extraction is underdeveloped to date. Therefore, our study focuses on extraction of fungal lipids using different extraction methods such as hexane extraction method and Bligh & Dyer method. The hexane method with significantly less toxic solvents usage than the Bligh & Dryer method (Chloroform) has high potential for future commercialization. Lipids were extracted from the biomass of fungal strain Mortierella isabellina using a Soxhlet apparatus with the solvent hexane. Initial experiments showed that the lipid yield from hexane extraction (48.7%) was higher than Bligh & Dyer method (46.7%) when extended the extraction time to five hours. The results indicated that hexane extraction method could be used for industrial fungal lipid production.

DEVELOPMENT OF TWO-STAGE CULTIVATION FOR PRODUCTION OF MICROALGAL CARBOHYDRATE

Danielle Boileau
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 58
Mentor(s): Wei Liao (Biosystems and Agricultural Engineering), Yan Liu (Biosystems and Agricultural Engineering), Zhenhua Ruan (Biosystems and Agricultural Engineering), Xiaoqing Wang (Biosystems and Agricultural Engineering)

Chlamydomonas reinhardtii, a unicellular green microalga, can store large amount of polysaccharides under certain culture conditions, which could be a prospective feedstock for biofuel production. Nitrogen starvation is a well-known method to achieve starch accumulation in the microalgae. However, the cell growth under the nitrogen starvation is much slower compared to when in the complete medium, which will influence microalgal carbohydrate production. Therefore, a two-stage algal culturing method was developed. C. reinhardtii was grown in a photobioreactor with full medium for biomass production in the first stage, and then microalgae biomass was transferred into nitrogen-depletion medium for carbohydrate accumulation in the second stage. For the first stage, the autotrophic culture condition was optimized in batch operation and applied into semi-continuous operation to enhance cell growth. In the second stage, an optimum amount of carbon dioxide concentration was determined based on the kinetics of carbohydrate accumulation. Cell composition including protein, carbohydrate and starch was monitored throughout the culture time.

REGENERATION ANALYSIS OF IRON OXIDE MEDIA TO IMPROVE PHOSPHORUS RECOVERY

Lauren Costantini
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 59
Mentor(s): Younsuk Dong (Biosystems and Agricultural Engineering), Steven Safferman (Biosystems and Agricultural Engineering)

Phosphorus is a limited resource that is a necessary nutrient for plant growth, making it an indispensable component of fertilizer for agricultural purposes. Although there is an intensified demand for phosphorus, it is simultaneously being discarded into the environment in crop land and storm water runoff and wastewater effluent. High concentrations can decrease the water quality and cause negative impacts such as stimulating of algal and aquatic growth, which depletes oxygen levels and leads to eutrophication. A media was developed by MetaMateria Technologies (Columbus, OH) to extract phosphorus from a water sample using the process of adsorption. The surface of the media is coated with iron nano-crystals, which surface precipitates the phosphorus, removing it from the water. The capacity to adsorb phosphorus diminishes over time, eventually requiring the disposal or regeneration of the exhausted media. Regeneration allows for reuse and the immobilized phosphorus to be recovered for beneficial use. Former regeneration studies indicated a low phosphorus recovery value. In this study, exhausted media was regenerated with three different procedures in order to provide insight about potential limiting factors. A sample was regenerated using the original procedure of soaking it in a basic solution for several hours in order to compare with past results. The remaining portions of the media were regenerated for several days, under both static and agitated conditions, to determine the effect of time and motion on the regeneration process.

INFLUENCE OF COOKING METHOD ON ACIDITY AND MOISTURE CHANGES IN SWEET POTATOES DURING IN VITRO GASTRIC DIGESTION

Julia Otwell
Home Institution: Michigan State University
Category & Time: Biosystems and Agricultural Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 60
Mentor(s): Gail Bornhorst (Biosystems and Agricultural Engineering)

Sweet potatoes are a valuable source of nutrients that have multiple health benefits. However, the nutrient uptake of sweet potatoes may be dependent on the cooking method. The objective of this study was to examine the acidity uptake and moisture content change of sweet potatoes during 240 min of *in vitro* gastric digestion after different cooking treatments. Sweet potatoes were cut into 11.6 mm cubes and cooked either by boiling or microwave steaming. The cooked cubes were subjected to *in vitro* digestion by 30 seconds of immersion in simulated saliva followed by incubation with simulated gastric juice at 37°C in a shaking water bath (100rpm). Samples were taken at 9 time points ranging from 0.5 to 240 minutes. Cooked, undigested samples were used as initial data. Each digestion was completed in triplicate. The initial acidity ranged from 0.207 to 0.457 mL HCl/g sample for boiled and microwaved sweet potatoes, respectively. After 240 min of digestion, the sweet potato acidity ranged from 0.639 to 0.684 mL HCl/g sample for microwaved and boiled, respectively. Moisture content increased by 6.5% in boiled sweet potatoes and 18% in microwaved sweet potatoes during 240 min of digestion. These results indicate that the acidity and moisture content of sweet potatoes increase over 240 min of simulated gastric digestion. This study has demonstrated the influence of cooking method on sweet potato behavior during *in vitro* gastric digestion. These results may be useful to provide cooking recommendations for sweet potatoes to increase satiety and regulate glucose absorption.

CELL BIOLOGY, GENETICS, & GENOMICS

ROLE OF PEROXISOMAL METABOLISM IN MODULATING HIGH LIGHT RESISTANCE AND PEROXISOME MORPHOLOGY

Shelby Hamlin
Home Institution: University of Wisconsin - Eau Claire
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 62
Mentor(s): Jianping Hu (Plant Biology)

Peroxisomes are important organelles in plants, which house a diverse array of metabolic pathways, such as photorespiration, hydrogen peroxide detoxification, glyoxylate cycle, and others. I am investigating the role of peroxisomal metabolism in modulating high light resistance and peroxisome morphology. Peroxisome proliferation involves a series of morphological changes executed by

the sequential actions of PEROXIN11 proteins that act as membrane elongation factors and the dynamin-related proteins and FISSION1 proteins that together facilitate fission into daughter peroxisomes. Interestingly, previous work in the lab found that Arabidopsis plants overexpressing a metabolic enzyme, citrate synthase (CSY), showed elongated/aggregated peroxisome phenotypes. We hypothesized that the peroxisome phenotypes observed in the CSY overexpression are linked to altered levels of citrate, which could be a metabolic cue triggering peroxisome proliferation in plants. I am examining the transcript and protein levels of the known peroxisome division factors to address this possibility. In addition, using CSY mutants I will observe peroxisome morphology under citrate depleted conditions, to better understand its' role in peroxisome proliferation. Research in our lab has shown that under high light stress condition, photorespiratory mutants have higher levels of hydrogen peroxide but less induction of protective pigment anthocyanin. Previous studies indicate that hydrogen peroxide can act as a signaling molecule for transcriptional suppression of anthocyanin biosynthetic pathway. I am using RT-PCR to examine the transcriptional regulation of the anthocyanin biosynthetic pathway in such mutants. Results obtained will enhance our understanding of how photorespiration modulates high light resistance.

BEHAVIORAL RESPONSES OF D. MELANOGASTER EXPOSED TO OLFACTORY CUES OF S. SCENICUS

Sydney Israel
Home Institution: Loyola University Maryland
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 63
Mentor(s): Ian Dworkin (Zoology)

Olfactory cues emitted by a predator species can play an important role in recognition and avoidance of that predator for prey species like insects. The fruit fly *Drosophila melanogaster*, responds to the presence of the Zebra jumping spider, *Salticus scenicus,* by altering numerous aspects of its behavior. In particular by decreasing the amount of time spent grooming, while increasing overall locomotion. Although it is known that *D. melanogaster* have versatile olfactory cues, it remains unclear what specific sensory modalities (visual, olfactory) *D. melanogaster* is using to identify the spiders. This is essential for understanding how the risk of predation is assessed and effectively responded to. We examined the behavioral responses of *D. melanogaster* exposed to the chemical cues of *S. Scenicus.* It was hypothesized that *D. melanogaster* can respond to the olfactory cues from *S. scenicus* and adjust their time spent in each behavior in order to avoid predation. We also hypothesized that the number of state changes would increase for *D. melanogaster* exposed to *S. scenicus*. *D. melanogaster* was observed for behavioral responses to olfactory cues induced by the *Salticus scenicus*. Responses were assessed using four treatment groups: A. a control, i.e. no spider and/or fly, B. *S. scenicus* by itself, C. S. scenicus that have consumed *D. melanogaster*, and D. *D. melanogaster* by itself. We predicted that *D. melanogaster* exposed to cues from that of *S. scenicus* would experience an overall decrease in grooming behaviors and an increase in behaviors of locomotion.

RNA-SEQ ANALYSIS OF THE TOMATO FRUIT TRANSCRIPTOME: ROLE OF *KNOTTED-LIKE* HOMEODOMAIN GENES IN ESTABLISHING GENE EXPRESSION GRADIENTS

Matt Miller
Home Institution: Grinnell College
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 64
Mentor(s): Cornelius Barry (Horticulture), Swathi Nadakuduti (Horticulture), Krystle Wiegert (Horticulture)

Tomato fruits are an important source of nutrients in the human diet and also serve as a model crop plant for exploring the regulation of fleshy fruit development and ripening. The chlorophyll content of developing fruits contributes directly to the quality of ripe fruit by impacting color, flavor and antioxidant activity. In wild type tomato fruit a latitudinal gradient of chloroplast development exists, with increased chlorophyll content in the shoulder relative to the base. The formation of this gradient requires functional alleles at the *uniform-ripening* (*u*) and the *uniform gray-green* (*ug*) loci, which encode the transcription factors GOLDEN 2-LIKE (SlGLK2) and TKN4, a class I KNOTTED1-LIKE homeodomain (KNOX) protein, respectively. *TKN4* positively regulates *SlGLK2* expression in a gradient-dependent manner that mirrors the chloroplast gradient observed in fruit. Over-expression of a second KNOX TF, *TKN2*, in the *Curl* (*Cu*) mutant disrupts this gradient, leading to ectopic expression of *SlGLK2* and high chlorophyll content throughout the entire tomato fruit. To acquire improved understanding of the role of *KNOX* genes in establishing gene expression gradients and regulating chloroplast development in tomato fruit, RNA-seq was performed in triplicate on samples extracted from the shoulder and base of wild type, *ug* and *Cu* fruits at the mature green stage of development. Approximately 14.5 million processed reads per sample were mapped to the tomato genome and gene expression was estimated using the Tuxedo suite. Progress on identifying and characterizing differentially expressed genes will be presented.

MIRNA-15A REGULATES VEGF LEVELS IN THE DIABETIC RETINA: A NOVEL THERAPEUTIC TARGET FOR DIABETIC RETINOPATHY

Abid Ahmad
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 65
Mentor(s): Julia Busik (Physiology), Elahé Crockett (Medicine), Qi Wang (Physiology)

Background: Overexpression of cytokines/growth factors contributes to the development of diabetic retinopathy, (DR), a disabling diabetic complication. Vascular endothelial growth factor, (VEGF), increases retinal permeability and induces neovascularization; finding ways to control VEGF in DR is of utmost importance. MicroRNAs (miRNAs) serve as post-transcriptional negative-regulators

of target genes. We previously demonstrated that miRNA-15a is downregulated in diabetic retinas. **Methods/Results:** To test the **hypothesis** that miRNA-15a modulates VEGF expression, the effect of miRNA-15a on VEGF mRNA and protein levels in human retinal pigment epithelial (HRPE) cells exposed to normal and high glucose (NG, HG) were evaluated by real time-PCR and ELISA, respectively. VEGF mRNA expression in HRPE cells increased from .0033±5.23E-05 in NG to .0056±9.48E-04 in HG. Mimic-15a downregulated VEGF mRNA expression (NG=0.0022±8.61E-05, HG=0.0035±4.49E-04). VEGF protein expression was 345±32.91pg/ml in NG and 422±7.19pg/ml in HG. Mimic-15a decreased VEGF protein expression (NG=301.13±22pg/ml, HG=373.14±57.8pg/ml). Inhibition of miRNA-15a showed the opposite effect. VEGF mRNA expression was increased by inhibitor 15a (NG=0.0058±.0012, HG=0.0065±5.03E-04). VEGF protein expression increased to 532.78±57.28 pg/ml in NG and 586.31±28.44 pg/ml in HG. Furthermore, HG inversely regulated miRNA-15a and VEGF expression in HRPE cells. VEGF secretion was induced in HRPE cells subjected to HG and overexpression of miRNA-15a by miRNA-15a mimic inhibited this effect. **Conclusion:** miRNA-15a is a potential therapeutic target to control VEGF levels, thereby ameliorating the effects of DR. **Support:** A.A. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director; NIH RO1EY016077-01A1 to Julia V Busik; JDRF 3-PDF-2014-108-A-N to Qi Wang.

ACETAMINOPHEN INCREASES HEPATOCYTE TISSUE FACTOR PROCOAGULANT ACTIVITY IN VITRO

Anna Wojcicki
Home Institution: University of Minnesota
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 66
Mentor(s): James Luyendyk (Pathobiology & Diagnostic Investigation)

BACKGROUND: Acetaminophen (APAP) overdose is the foremost cause of acute liver failure in the United States. APAP hepatotoxicity is linked with robust coagulation cascade activation in mice and humans. Previous studies in mice have shown that the procoagulant response after APAP overdose is initiated by tissue factor (TF), the transmembrane receptor for coagulation factor VII/VIIa. Hepatocytes are the primary cellular target of APAP toxicity, and have been shown to express TF in a form that lacks procoagulant activity. We hypothesized that treatment of hepatocytes with APAP would cause a concentration- and time-dependent increase in TF procoagulant activity. METHODS: Primary mouse hepatocytes were isolated from wild-type C57Bl/6J mice by collagenase digestion, and subsequently treated with various concentrations of APAP (0-5 mM) in William's Medium E for various times (2-24 hours). Cell-associated TF activity was assessed using a two-stage factor Xa generation assay. Cytotoxicity was estimated by measuring the release of alanine aminotransferase into the cell culture medium. RESULTS: Initial results show that treatment of cells with APAP causes a concentration - dependent increase in cell-associated TF-dependent Xa generation, coupled temporally with an increased release of alanine aminotransferase into the culture medium. CONCLUSION: The results suggest that APAP cytotoxicity is associated with increased TF activity in cultured hepatocytes. FUNDING: NIH 5R25HL103156-04

ECTODOMAIN SHEDDING IN THE DOWN-REGULATION OF CELLULAR ACE-2 BY ER STRESS IN LUNG CELLS

Vinh Dang
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 1, 1:00 PM - 2:00 PM
Poster: 67
Mentor(s): Elahé Crockett (Medicine), Bruce Uhal (Physiology)

Introduction: Previous work from this laboratory has demonstrated that the generation of angiotensin II (ANGII) mediates lung fibrosis. Fibrosis is mediated by the apoptosis of alveolar epithelial cells (AECs), aberrant fibroblast proliferation, and the accumulation of collagen. It was shown that angiotensin converting enzyme-2 (ACE-2) protects against lung fibrosis by limiting the local accumulation of the profibrotic peptide, ANGII. This is achieved by converting ANGII to angiotensin 1-7 (ANG 1-7). However, this protective enzyme is down-regulated in human and experimental lung fibrosis. **Hypothesis:** One of the mechanisms of the down-regulation of cellular ACE-2 may be mediated by ectodomain shedding through ADAM17/TACE. **Methods/Results:** To determine if ectodomain shedding leads to the down-regulation of cellular ACE-2, five-day post confluent A-549s were treated with 20 μM CLBL in the presence or absence of 2 μM TAPI-2, an inhibitor of ADAMS17/TACE. Western blots were performed on samples from cell lysates and media. In the cell lysates, densitometry showed a significant increase in ACE-2 with TAPI-2 treatment. The media showed a significant decrease with TAPI-2 treatment. **Conclusion:** From this data, we can speculate that ADAMS17/TACE may play a partial role in down-regulating ACE-2 by degrading it, in addition to other enzymes. With this model, further research can be done to investigate alternative mechanisms that lead to down-regulation of cellular ACE-2 in lung cells. **Support:** V.D. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

EFFECT OF DIESEL EMISSION PARTICLES ON THE NRF2 SIGNALING PATHWAY IN THE MOUSE HIPPOCAMPUS

Roel Becerra
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 69
Mentor(s): Colleen Hegg (Pharmacology and Toxicology)

RATIONALE: Many people suffer from neurodegeneration diseases, such as Alzheimer's and Parkinson disease. One potential contribution to these diseases is the exposure to environmental air pollutants that are common in North America. Environmental air pollutants negatively affect the brain leading to dysfunction in learning and memory. At this point, it is not known how air pollutants cause brain dysfunction. Neurogenesis, which occurs when stem cells proliferate, differentiate and survive, is controlled by genetic and environmental factors. The lab previously showed that diesel emission particles (DEP) decrease neurogenesis in the

hippocampus. The transcription factor [nuclear factor (erythroid-derived 2)-like 2] (NRF2) is involved in the regulation of redox homeostasis and neurogenesis. Antioxidant enzymes, like heme oxygenase 1 (HO-1), NADP(H) quinone oxidoreductase (NQO1) are regulated by Nrf2. We hypothesize that exposure to diesel emission particles (DEP) decreases neurogenesis in the dentate gyrus via an Nrf2-mediated mechanism.

THE ROLE OF SEROTONIN IN EPITHELIAL CELL PROLIFERATION AND APOPTOSIS IN THE MOUSE ILEUM
Ronald Roseman
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 70
Mentor(s): Elahé Crockett (Medicine), Mark Kadrofske (Pediatrics)

Introduction: NEC (Necrotizing Enterocolitis) is an acute inflammatory disease of the intestine that almost exclusively affects preterm infants, accounting for 60-80% of cases with a mortality rate of 20-40%. The cause of NEC is unclear and difficult to diagnose. To investigate NEC in more detail we began looking at the epithelial layer of the gastrointestinal (GI) tract. Epithelial barrier integrity is important to prevent inflammation in the GI tract. Serotonin, a neurotransmitter secreted by enterochromaffin cells, is primarily found 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. **Hypothesis:** Serotonin may alter epithelial apoptosis and regulate barrier integrity. **Methods/Results:** To study intestinal inflammation we harvest ileum tissue from wild-type (WT) and TPH-1$^{-/-}$ knockout (KO) mice models. Harvested tissue is then processed and used for Western Blotting and immunohistochemistry (IHC). Apoptosis was measured by Western Blotting for cleaved caspase-3. Caspase-3 plays a central role in the execution for cell apoptosis. The purpose of using the cleaved caspase-3 is to compare the expression of this protein between our two mice models. This could potentially aid in understanding the mechanisms of regulating the epithelial barrier integrity in the GI tract. Our results may determine whether serotonin is an endogenous paracrine molecule regulating GI epithelial proliferation and/or apoptosis. **Support:** R.R. is a REPID scholar and is supported by an NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

SILICA-INDUCED B-CELL LUNG INFILTRATION IS SUPPRESSED BY N-3 FATTY ACID SUPPLEMENTED DIET
Gerald Lilly
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 71
Mentor(s): Jack Harkema (Pathobiology & Diagnostic Investigation), Kazuyoshi Kumagai (Pathobiology & Diagnostic Investigation), James Wagner (Pathobiology & Diagnostic Investigation), Elahé Crockett (Medicine)

Introduction: Inhalation of silica is suspected to cause exacerbation of autoimmune diseases like systemic lupus. NZB/WF1 mice spontaneously develop lupus-like renal disease that is attenuated by dietary supplementation of an n-3 polyunsaturated fatty acid (PUFA), docosahexaenoic acid (DHA). The **Objective** of our study was to determine the effects of DHA supplementation on silica-induced lung lesions in lupus-prone mice. **Methods**: NZB/W F1-mice were fed diets supplemented with 0%, 1%, 3%, or 6% DHA for 2 weeks prior to intranasal administration of 25µl saline containing 0 or 1mg silica (weekly for 4 wk). Mice were maintained on their diets until the time of sacrifice, 12 wk post-instillation. Lung tissue sections were immunohistochemically processed for B-lymphocytes using a CD45R antibody. Severity of B lymphocyte infiltration was determined by morphometry. **Results:** Lungs of NZB/W F1-mice fed normal diets and exposed to silica had severe peri-vascular and -bronchiolar lymphoplasmacytic infiltration containing numerous CD45R-positive B lymphocytes. In contrast, silica-exposed mice fed diets supplemented with 1%, 3% and 6% DHA had markedly decreased CD45R-positive B-lymphocyte infiltration as compared to similarly exposed mice fed normal diets (80%, 98%, and 96% reduction, respectively). **Conclusion:** Our results suggest that consumption of n-3 PUFAs might be effective in preventing silica-induced exacerbation of autoimmune lung disease. **Support:** G.L. is a REPID scholar, supported through an NIH-5-R25-HL108864 award to Elahé Crockett REPID-Program Director.

TARGETING MIXED LINEAGE KINASES IN GLIOBLASTOMA
Evita Moody
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 72
Mentor(s): Elahé Crockett (Medicine), Kathleen A. Gallo (Physiology), Sean Misek (Physiology)

Introduction: Glioblastoma (GBM) is the most common and deadliest form of brain tumors found in adults with a 5-year survival rate of less than 15%. Because glioblastoma invades neighboring brain tissue, complete removal of tumors is impossible, leading to recurrence. Signaling through the epidermal growth factor receptor (EGFR), a receptor tyrosine kinase (RTK), is activated in at least 50% of GBM tumors and is associated with malignant phenotypes. Directly targeting EGFR has been largely unsuccessful due, in part, to upregulation of other RTKs. Our study focuses on potential new therapeutic approaches to target intracellular kinases that signal downstream of multiple RTKs. Kinase inhibitors have been successful for treating many forms of cancer. Identifying and targeting protein kinases may be a viable strategy for treating glioblastoma. The Mixed Lineage Kinases (MLKs) are MAP3Ks that activate multiple MAPK pathways, including the c-Jun N-terminal kinase (JNK), ERK, and p38 pathways. Our lab and others have demonstrated the importance of MLK signaling in multiple cancer types including glioblastoma (unpublished data). **Hypothesis:** To compare the effects of two structurally unrelated MLK inhibitors on malignant phenotypes using human glioblastoma lines, LN-18 and U87MG. **Methods/Results:** The effect of MLK inhibitors on key downstream signaling pathways was determined by

immunoblotting with phospho-specific antibodies, a wound healing assay, and viability. **Conclusion:** Based on the data obtained, MLKs could be useful therapeutic targets for combating glioblastoma. **Support:** E.M. is a REPID scholar, support by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

THE EFFECTS OF VARYING EXTRACELLULAR CALCIUM CONCENTRATION ON METHYLMERCURY-INDUCED DOPAMINE RELEASE IN UNDIFFERENTIATED PC12 CELLS

Yssa Rodriguez
Home Institution: St. Mary's University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 73
Mentor(s): Madiha Khalid (Pharmacology and Toxicology)

Methylmercury (MeHg) has been introduced into the aquatic environment by chemical plants, where it bioaccumulates inside marine life. Humans develop MeHg poisoning when ingesting contaminated fish or shellfish. Affecting both children and adults, MeHg damages the central nervous system by interfering in the release of neurotransmitters in synaptic clefts resulting in an increase in spontaneous release of transmitters. MeHg-induced cells were found to show a significant increase in dopamine (DA) synthesis, intracellular DA, and vesicular exocytosis. Therefore, it has been shown that MeHg exposure results in a concentration and time - dependent increase in spontaneous DA release. Previous experiments done in our lab displayed reduced extracellular DA levels when extracellular Ca2+ was removed from MeHg-treated cells. Extracellular Ca2+ is known to mediates DA release, while MeHg interferes with extracellular Ca2+ equilibrium. PC12 cells are a clonal cell lines derived from a pheochromocytoma of the rat adrenal medulla, which contain Ca2+ channels and release dopamine. Therefore, we use undifferentiated PC12 cells in our experiments to investigate the effect of a 2 μM MeHg exposure on extracellular DA levels while varying extracellular Ca2+ concentrations. Following treatment, DA levels will be quantified using the technique of High-Performance Liquid Chromatography (HPLC) coupled to electrochemical detection. As complete removal of extracellular Ca2+ significantly reduced DA levels, we expect to see a concentration-dependent increase in MeHg-induced extracellular DA levels as extracellular Ca2+ concentrations are increases.

D. MELANOGASTER BEHAVIORAL RESPONSE TO OLFACTORY CUES OF S. SCENICUS

Carla Jones
Home Institution: North Carolina A&T State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 2, 2:00 PM - 3:00 PM
Poster: 74
Mentor(s): Ian Dworkin (Zoology)

Olfaction is important for some prey to detect its predators. This allows them to respond by demonstrating anti-predatory behaviors. The ability to sense chemical cues are also prevalent in identifying mates, finding food, and realizing chemical dangers. Previous studies demonstrated that Drosophila melanogaster responds anti-predatorily to a zebra-jumping spider, Salticus Scenicus. However, this did not show that D. melanogaster could respond solely to the chemical cue of S. Scenicus. We are studying if olfactory cues induced by S. scenicus influence the behavior of D.melanogaster. If anti-predation behavior is directly proportional to detecting the smell of a predator, then we expect that the flies exposed to the spider and spider-fly petri dishes will experience behavioral changes. We hypothesize that D. melanogaster will be able to respond to the olfactory cues induced by S. Scenicus. We predict that the flies in the petri dishes conditioned with fly-spider and spider will a) have an increase of locomotive behavior b) decrease in grooming behaviors and c) an increase of the number of state changes. If flies do respond to olfactory cues further studies could lead to neuronal mapping. To compare the fruit fly behavior we conditioned petri dishes using four different treatments: spider, spider + fly, fly, and empty. After 24 hours, the conditioned petri dishes are emptied and a naïve fly is added to each dish. Its behaviors are observed and recorded for five minutes.

SYMPATHETIC TONE DIFFERENTIALLY REGULATES MHC-II EXPRESSION IN MACROPHAGES AND ENTERIC GLIA IN THE GASTROINTESTINAL TRACT

Robert Vanderkamp
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 3, 2:00 PM - 3:00 PM
Poster: 76
Mentor(s): Brian Gulbransen (Physiology)

The sympathetic nervous system modulates intestinal motility, secretion, vasoregulation, and immunity. Specifically, sympathetic innervation plays a key role in innate and adaptive immune responses at the level of the intestinal mucosa. How sympathetic innervation regulates immunity at the level of the enteric nervous system is uncharacterized. Norepinephrine regulates expression of major histocompatibility complex (MHC) class II molecules in astrocytes and microglia in the brain. Sympathetic innervation of their counterparts in the gut, enteric glia and macrophages, may serve a similar function. We hypothesized that sympathetic innervation of macrophages and enteric glia regulates their antigen-presenting capacity by modulating MHC-II expression. We tested our hypothesis by assessing MHC-II expression in enteric glia and macrophages before and after removal of sympathetic innervation. Sympathetic innervation to the gut was ablated by surgery or treatment with the chemical 6-hydroxydopamine. Norepinephrine content was depleted by treatment with reserpine. Tissue was harvested one week following treatment and whole-mount preparations of the gut wall prepared by microdissection. Expression of MHC-II in enteric glia or macrophages was assessed by dual-label immunohistochemistry and mean fluorescence compared with Student's t-test. Ablation of sympathetic innervation significantly increased MHC-II expression in macrophages ($P<.005$) surrounding the myenteric plexus but had no effect on MHC-II expression by enteric glia. Depletion of norepinephrine content had no effect on MHC-II expression by either enteric glia or

macrophages. Our results suggest that sympathetic innervation differentially controls MHC-II expression by enteric glia and macrophages.

GENETIC INSIGHTS INTO THE GROWTH-DEFENSE ANTAGONISM IN ARABIDOPSIS THALIANA

Kayla Moses
Home Institution: Wheaton College
Category & Time: Cell Biology, Genetics, and Genomics, Section 3, 2:00 PM - 3:00 PM
Poster: 77
Mentor(s): Marcelo Campos (Plant Research Lab)

The current paradigm for resource allocation in plants describes a system in which investment in one process comes at the expense of another. During times of stress, plants are faced with a "dilemma" of whether to dedicate photoassimilates to growth or defense. This decision has profound implications in agriculture and ecological systems, yet little is understood about the molecular mechanism behind it. A plant devoting more energy to defense allocates less energy to growth and development, and is consequently smaller in stature. Jasmonate (JA) is a fatty-acid derived plant hormone that regulates resource allocation during times of stress by prioritizing resources for defense. During stressful conditions (ie. insect feeding), JA accumulates and promotes the degradation of JASMONATE-ZIM domain (JAZ) repressor proteins, which are negative regulators of defense-related genes. We recently developed a jaz Quintuple (jazQ) knockout mutant that lacks five of the twelve JAZ repressors present in the Arabidopsis thaliana genome. As a result, JA-responses are constitutively activated, resulting in highly defended plants that are resistant to insect herbivory but also hindered in many growth processes. In an attempt to further dissect the growth-defense dilemma, jazQ plants were EMS-mutagenized in search for mutants that retain the defense phenotype of jazQ without experiencing deficient growth. Resulting from this, more than seventy putative sjq (suppressors of jazQ phenotype) mutants were identified with phenotypes currently being confirmed in the M3 and M4 generations. Phenotypic characterization and the identification of causative mutations in confirmed sjq mutants are already providing insight behind growth-defense antagonism.

INVESTIGATING THE MOLECULAR BASIS FOR SANCTIONS AGAINST NON-FIXING RHIZOBIA IN MEDICAGO TRUNCATULA

Shawna Rowe
Home Institution: University of Missouri
Category & Time: Cell Biology, Genetics, and Genomics, Section 3, 2:00 PM - 3:00 PM
Poster: 78
Mentor(s): Maren Friesen (Plant Biology)

Symbiotic relationships between legume plants and nitrogen-fixing bacteria, rhizobia, result in large amounts of beneficial nitrogen production each year. The model legume Medicago truncatula cannot fix nitrogen alone and engages in a symbiotic relationship with rhizobia where root nodules are formed and fix nitrogen for the plant in exchange for carbon. However, there are rhizobia strains that form root nodules but fail to fix nitrogen, thus acting like parasites. Fixing and non-fixing bacteria are able to simultaneously infect Medicago. It is currently unclear why non-fixing or "cheating" rhizobia are able to effectively take carbon from plants without fixing nitrogen in return. Furthermore, it is unknown if the two types of rhizobia are separated within individual nodules. To investigate this interaction, florescence tagging and gene expression analysis will be used to determine the location of rhizobia and transcript level differences between the different types of nodules. Additionally, to investigate the role of ethylene in regulation of nodule formation, super-nodulating mutants that are sensitive and insensitive to ethylene will be compared to determine the role of this hormonal pathway in the presence of mixed nodules and "cheating" nodules. Finally, the ability of Medicago to enact sanctions on "cheating" rhizobia will be investigated by altering the plant's ability to biosynthesize ethylene. The goal of this research is to reveal how plants are able to recognize and prevent parasitic rhizobia from infecting roots while allowing beneficial rhizobia to form fixing nodules. A better understanding of root nodulation is critical for agriculture.

THE COEXPRESSION OF NEUROTENSIN RECEPTOR-1 AND PLATELET DERIVED GROWTH FACTOR-ALPHA IS UNIQUE TO THE FIBROBLAST-LIKE CELLS OF THE COLON

Tyler Bonkowski
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 3, 2:00 PM - 3:00 PM
Poster: 79
Mentor(s): Raluca Bugescu (Physiology), Gina Leinninger (Physiology)

Neurotensin (Nts) is a 13 amino acid peptide that is produced within cells of the intestine and the brain and is implicated in the regulation of body weight. Nts acts via binding to cells that express Neurotensin Receptor-1 or (NtsR1) but the lack of facile techniques to identify NtsR1-expressing cells has limited our understanding of precisely where and how Nts acts throughout the body. We therefore utilized a transgenic mouse model and Cre/Lox technology to identify NtsR1 expressing cells via their expression of green fluorescent protein (GFP): we refer to these as NtsR1T-GFP mice. Using this model, we identified neurons expressing GFP (NtsR1 cells) within the ventral tegmental area (VTA) and substantia nigra (SN) of the brain, regions implicated in regulating motivated feeding and movement behaviors. We also identified GFP-expressing NtsR1 cells within non-neuronal cells of the myenteric plexus of the intestine. Given the specialized roles of neurons and cells of the intestine, we hypothesized that NtsR1-expressing cells in the brain and intestine differ at the molecular level in order to regulate distinct, organ-specific responses to Nts. We therefore combined the use of NtsR1T-GFP mice and immunofluorescent staining to determine whether brain and intestine cells express similar proteins. In particular, we examined whether NtsR1 cells in the brain and intestine cells co- express tyrosine hydroxylase (a marker of VTA/SN neurons) and Platelet Derived Growth Factor Receptor-Alpha (PDGFR-α), a marker of intestinal fibroblast-like cells. Our data suggest that NtsR1 cells within different organs indeed have a unique molecular profile.

INVESTIGATING GENETIC VARIATION IN THE RHIZOBIAL SYMBIOSIS OF MEDICAGO POLYMORPHA DURING INVASION
Katherine Wozniak
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 3, 2:00 PM - 3:00 PM
Poster: 80
Mentor(s): Maren Friesen (Plant Biology)

Globally important mutualisms include gut flora in humans, algae in coral reefs and nitrogen-fixing bacteria in legumes. The Ensifer medicae-Medicago polymorpha mutualism can be found on all continents except Antarctica and increases plant growth due to symbiotic nitrogen fixation in nodules. This legume-rhizobia symbiosis has agricultural and ecological importance and is a model system of how mutualisms operate in diverse ranges. To test whether invasive plant genotypes invest more in reproduction than natives, I will inoculate them in the laboratory using rhizobial strains originating from the invasive and native ranges. Single strain inocula will be compared to mixed inocula that allow plants to choose among rhizobia. Fluorescently marked strains will be inoculated into native and invasive genotypes to test whether more beneficial bacteria are selected. If invasive genotypes rely less on rhizobia, then root signals targeting rhizobia may be lessened but plants could increase signaling to other beneficial microbes, creating a more diverse microbiota in the invasive range. Root exudates will be harvested from native and invasive genotypes to determine differences in exudation profiles; e.g. native genotypes may secrete more proline which is used by rhizobium and invasive genotypes may have increased levels of amino acids if secondary metabolites aid in plant defense. The proposed series of inter-related experiments will investigate plant-rhizobial symbioses as they evolve and adapt in the invasive ranges. Learning the mechanisms of invasive plant colonization could prevent parasitic invasions or promote those which enhance biodiversity.

TARGETING CANCER PATHWAYS: GLUCOCORTICOID RECEPTOR IN COLORECTAL CANCER
Irene LI
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 4, 3:00 PM - 4:00 PM
Poster: 82
Mentor(s): Christina Chan (Chemical Engineering & Material Science), Aritro Nath (Genetics)

The advent of high-throughput technology has enabled global analysis of the transcriptome, driving the development and application of computational approaches to study transcriptional regulation and identify therapeutic molecular targets on the genome scale. Current identification methods require researchers to sort through myriad genes and potential pathways. In comparison to traditional methods focusing only on pairwise normal and cancer samples, we used a novel approach that capitalizes on a wide range of samples and conditions to collect differentially expressed genes with a high degree of specificity to colorectal cancer, the second leading cause of cancer-related death in the United States. Based on literature results and a comparison of the pairwise and multiple analyses, we identified two genes involved in regulating the CRC phenotype: glucocorticoid receptor (GR) and ring finger protein 43 (RNF-43), which serve as a tumor suppressor and oncogene respectively. We propose a regulatory mechanism between the GR and RNF43 genes, involving GR as a negative regulator of RNF-43. This was experimentally confirmed through selective knockdown of mRNA expression in HCT116 CRC cell line. Establishment of GR as a repressor of RNF-43 mediated oncogenic pathways could provide a specific target for CRC treatment in future studies.

EFFECTS OF AGING ON THE ACTIVITY OF ATP-SENSITIVE POTASSIUM CHANNELS IN SKELETAL MUSCLE RESISTANCE ARTERIES
Chantelle Washington
Home Institution: Michigan State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 4, 3:00 PM - 4:00 PM
Poster: 83
Mentor(s): William Jackson (Pharmacology and Toxicology)

ATP-sensitive potassium channels (KATP) regulate arteriolar tone, contributing to functional hyperemia as well as resting blood flow. Aging is associated with reduced skeletal muscle blood flow and impaired functional hyperemia in mice and in humans. However, the mechanisms responsible for these effects are not known. This experiment will test the hypothesis that aging reduces the activity of KATP in skeletal muscle resistance arteries from C57BL/6 mice. Using pressure myography, changes in the diameter of cannulated small arteries dissected from the abdominal muscles of young (3 months) and old (24 months) mice will be measured at 80cm H20 and 37 °C in the absence and presence of levcromakalim (KATP agonist) and glibenclamide (KATP antagonist). Treatment with levcromakalim should yield smaller dilation in arteries from old than in vessels from young mice. If this is true, it will provide support for the hypothesis that aging negatively affects KATP and contributes to the impaired regulation of blood flow in the aged. This finding could provide a target for pharmaceuticals to treat the effects of aging on the vasculature.

HIGH THROUGHPUT PHOTOSYNTHETIC PHENOTYPE SCREENING OF NANNOCHLOROPSIS OCEANICA MUTANTS
Shaun Stice
Home Institution: University of Portland
Category & Time: Cell Biology, Genetics, and Genomics, Section 4, 3:00 PM - 4:00 PM
Poster: 84
Mentor(s): Zhiyan Du (Biochemistry & Molecular Biology)

Nannochloropsis oceanica is a species of oleaginous algae that has increasingly become a major focus for academic research. N. oceanica is ideal for academic investigation due to the fact that it: has a small genome, grows quickly, and can generate high

amounts of lipid such as TAG (triacylglycerol), a feedstock for biofuel. Recently the Benning lab has released the draft genome sequence of N. oceanica and has developed techniques for nuclear transformation to stably integrate foreign DNA into the genome. These techniques have allowed for a foreword genetic approach in investigating the relationship between photosynthesis and energy storage. This study aims to perform a high throughput photosynthetic phenotype screen on many hundreds of mutants that have been generated via random insertion mutagenesis in the Benning lab. The mutant strains will be screened with a specially designed fluorescence imager developed by the Kramer lab. This imager collects data of non-photochemical quenching (NPQ), plant stress measurements (Fv/Fm), high energy state quenching (QE), and photo inhibition (QI), which are all related to the efficiency of photosynthesis. When comparing these variables between the wild type and mutant strains, we should be able to find interesting mutants with either increased or decreased photosynthetic efficiency. Mutants with such characteristics will be invaluable assets for future academic research of N. oceanica.

EXPRESSION OF CITRULLINATED PROTEINS IN THE ENTERIC NERVOUS SYSTEM IN HEALTH AND DISEASE

Bianca Romo
Home Institution: St. Mary's University
Category & Time: Cell Biology, Genetics, and Genomics, Section 4, 3:00 PM - 4:00 PM
Poster: 85
Mentor(s): Brian Gulbransen (Physiology)

The enteric nervous system (ENS) is the third division of the autonomic nervous system and resides within the intestinal wall. Essential ENS functions including the coordination of patterns of movement, exchange of fluids across the mucosa and control of blood flow are altered by intestinal inflammation. The mechanisms of inflammation-induced ENS dysfunction are incompletely understood. Chronic inflammation can promote citrullination or deamination; a post-translational modification of proteins where enzymes called peptidylarginine deiminases attach a keto-group on the amino acid. Citrullinated proteins are often targeted by the immune system and anti-citrullinated protein antibodies are found in autoimmune diseases such as rheumatoid arthritis and experimental autoimmune encephalomyelitis. We hypothesized that post-translational modification of ENS proteins through citrullination contributes to ENS dysfunction following inflammation. We tested our hypothesis by investigating the expression of citrullinated proteins during active inflammation in the mouse intestine. Intestinal inflammation was induced with the chemical, dinitrobenzenesulfonic acid (DNBS) in male C57B16 mice and tissue was harvested after 6-48 hours. Whole-mount preparations of the ENS were prepared by microdissection and processed with immunohistochemistry using an antibody called F95 that recognizes all deiminated proteins. After preliminary tests in the 6 hour tissue, the immunofluorescence of F95 was not significantly different in control and DNBS tissue (P= 0.8735). Our results suggest that at this early stage of inflammation there are no citrullinated proteins present. Future tests will be conducted to determine the presence of citrullinated proteins during later stages of inflammation.

DIFFERENT DROSOPHILA MELONGASTER OVERGROWTH PHENOTYPES THAT ARISE FROM MUTATIONS IN THE HEDGEHOG PATHWAY

Jordan Stewart, Frank Adamini, Shannon Moore
Home Institution: University of Detroit Mercy
Category & Time: Cell Biology, Genetics, and Genomics, Section 4, 3:00 PM - 4:00 PM
Poster: 86
Mentor(s): Jacob Kagey (University of Detroit Mercy: Biology)

Many developmental pathways are altered during human cancer development. A substantial number of these pathways are evolutionarily conserved in Drosophila melanogaster, such as the Hedgehog signaling pathway. The Hedgehog pathway is commonly altered in basal cell carcinoma and medulloblastoma. Using controlled crosses we can create tissue that has both homozygous mutant and homozygous wild type cells (denoted by the presence of GFP). Using this technique we have assayed the tumor phenotypes of two different Hedgehog mutants, patched (ptc) and costal 2 (cos). These experiments were conducted in different genetic backgrounds that either allowed or prevented cellular apoptosis. Despite these mutations occurring in the same molecular pathway, we have observed distinct overgrowth phenotypes. Differences in autonomy were seen in the eye where ptc-/- displayed an overgrown eye with more wild type than mutant tissue. This is contrasted with cos-/- overgrown eyes, which were comprised of equal proportions of mutant and wild type tissue. Comparing the autonomy of the two mutants in the wings there was negligible difference. Although the autonomy of both mutants was similar in the wing, ptc-/- wing discs were larger. When cell death was reintroduced into the genetic background of the wing, cos-/- larvae were able to survive to adulthood while most ptc-/- died in the pupal stage. These differences may be instrumental in our understanding of human tumors with altered Hedgehog signaling.

THE SEARCH FOR TASTE RECEPTORS IN THE SEA LAMPREY GENOME

Marlene Heberling, Tyler Peters
Home Institution: Vanderbilt University, University of Detroit Mercy
Category & Time: Cell Biology, Genetics, and Genomics, Section 5, 3:00 PM - 4:00 PM
Poster: 88
Mentor(s): Steven Chang (University of Detroit Mercy: Biology)

Organisms gain information from their environment by detection of chemical signals via smell and taste through a process called chemoreception. Sea lampreys are vertebrates of the class Agnatha that appeared about 560 million years ago and so lie at the base of the vertebrate lineage. The genome of the sea lamprey was recently sequenced and its unique phylogenetic position allows for comparative analyses with more recently evolved vertebrates to study the evolutionary history of vertebrates. Taste receptor genes (TAS) have not been well studied in sea lamprey and the sea lamprey genome is not well annotated with respect to TAS genes.

Taste receptors are a class of G-protein coupled receptors expressed in taste buds and are designated with the TAS prefix. Known TAS sequences include TAS 1R1-TAS1R3 and TAS2R1-TAS2R50. Our goal is to characterize the complement of taste receptor genes (TAS genes) in the sea lamprey genome and compare these genes to known TAS genes in other vertebrates. In this preliminary study, we have obtained mRNA sequences from each of the TAS gene families from other vertebrate species (Mus musculus, Rattus norvegicus etc.) and have aligned the TAS sequences using Guidance and MEGA software to create neighbor-joining trees. Using a representative sequence from each tree, we queried the sea lamprey genome to find putative sea lamprey TAS genes. The putative sea lamprey TAS genes were used to create new neighbor-joining trees to better visualize the evolutionary relationship of taste receptor genes in vertebrates.

REGULATION OF CYCLIC-DI-GMP IN VIBRIO CHOLERAE AND VIBRIO HARVEYI

Zamone Sawyer
Home Institution: The Ohio State University
Category & Time: Cell Biology, Genetics, and Genomics, Section 5, 3:00 PM - 4:00 PM
Poster: 89
Mentor(s): Chris Waters (Microbiology and Molecular Genetics)

Cyclic-di-GMP is a signal molecule that stimulates extracellular matrix synthesis in bacteria (Waters, 353). As the presence of cyclic-di-GMP increases in Vibrio cholerae bacteria, biofilms are produced. Biofilm production is important because it prevents V. cholerae from transitioning to the mobile, pathogenic state that exists once the bacterium enters the human small intestine. While it is known that cyclic-di-GMP binds to two proteins, or transcription factors, called FlrA and VpsR , additional transcription factors of cyclic-di-GMP induced promoters are not known. Reporter genes encoding green fluorescent protein (gfp) will give insight to the genetics and regulatory behavior of cyclic-di-GMP induced promoters in V. cholerae. In a related study, Vibrio harveyi, which is of the same genus as V. cholerae, does not produce biofilms in the presence of high cyclic-di-GMP. We hypothesize that mating V. harveyi and V. cholerae will give insight to the relationship between cyclic-di-GMP and biofilm production. We are inserting V. cholerae plasmid DNA in to E. Coli cells, mating the cells with V. harveyi, increasing the presence of cyclic-di-GMP, and looking for the production of biofilms. These studies will yield results and enhance understanding of the role of cyclic-di-GMP in bacterial biofilm production which directly impacts the health and well-being of mankind as we have the potential to encounter harmful bacteria every day.

UTILIZING NATIVE PROTEOLYSIS MECHANISM FOR GENOMIC REGULATION

AJ Crawford
Home Institution: University of Saint Francis
Category & Time: Cell Biology, Genetics, and Genomics, Section 5, 3:00 PM - 4:00 PM
Poster: 90
Mentor(s): Danny Ducat (Plant Research Laboratories)

Utilization of biological entities, such as Synechococcus elongatus (cyanobacteria) as potential biofuels requires molecular tools and controls to regulate photosynthetic pathways. A unique method for down regulating genomic expression derives from the manipulation of the cell's native degradation system, in this case, ClpXP protease. In many bacteria, including Escherichia coli, when an error ridden mRNA reaches the ribosome for transcription, the ribosome recognizes the fault, and tags the end of the protein with a specialized tmRNA (degron tag) which is recognizable to the adaptor protein sspB. SspB then tethers and transports the tagged protein to ClpXP for proteolysis. By adding selectively modified sspB tags (derived from native e. Coli tags) to the genome segments of specific proteins, and inserting a non-native sspB under the control of a riboswitch, genes may be selectively placed under temporary controlled degradation (down regulation or complete protein inhibition based on the tag's predetermined binding affinity for sspB). This specialized system provides specific, functional control of the genome without completing knocking out a gene and rendering the cell unviable for future use. These tmRNA tags are essential to incorporate into the cell genome in order to suppress gene expression at will. Although the full potential of this system has not been experienced, successful tmRNA designs, as well as a riboswitch paired sspB have been incorporated into Synechococcus elongatus 7942's genome. Developing a technique for regulating gene expression post translation allows for degradation of essential proteins to be monitored in real time while qualifying the cellular response.

CHEMICAL GENOMICS SCREENING OF POTENTIAL ER NETWORK MODIFIERS IN A. *THALIANA* RHD3 MUTANTS

Alper Gokden
Home Institution: University of Arkansas at Little Rock
Category & Time: Cell Biology, Genetics, and Genomics, Section 5, 3:00 PM - 4:00 PM
Poster: 91
Mentor(s): Giovanni Stefano (Plant Biology)

The endoplasmic reticulum (ER) is involved in many processes that are at the core of the cell machinery. The ER is a network of tubules that forms a continuous reticulated network extending throughout the cell. In metazoans, homotypic fusion of ER membranes is facilitated by a family of proteins known as atlastins (ATL). The functional ortholog of this gene in A. *thaliana* plants, RHD3 (Root Hair Deficiency), has been found and shown to promote ER membrane fusion. Knockout mutants of RHD3 display a phenotype of short root and short root hairs, as well as abnormal ER shape. In mammals, mutation in the ATL1 gene is associated with spastic paraplegia disease. There are different pathologies associated with improper ER structure. A chemical genomics approach will be used to screen RHD3 knockout mutants in 3,000 different chemicals to search for a compound capable of reverting the mutant phenotype back to the wild type. Another set of screenings using confocal microscopy will be performed with stable A. thaliana plants expressing the fluorescent endoplasmic reticulum marker (ER-YK) to search for compounds that may alter the

structure of the ER. Once found, the action of these chemicals and their targets can be characterized to further our basic understanding of the ER and also to contribute towards finding a potential treatment for ER morphology related diseases.

THE EFFECTS OF IRRITANTS IN THE MOUSE OLFACTORY EPITHELIUM (OE) TISSUE

Charlene Rivera
Home Institution: University of Puerto Rico at Cayey
Category & Time: Cell Biology, Genetics, and Genomics, Section 5, 3:00 PM - 4:00 PM
Poster: 92
Mentor(s): Colleen Hegg (Pharmacology and Toxicology), Tania Iqbal (Neuroscience)

Our nose is the first line of defense against harmful irritants and pollutants from the environment. TRPA1 is a Transient Receptor Potential channel that can be found in the neurons of the olfactory epithelium. TRPA1 plays an essential role in the process through which irritants from the environment depolarize nociceptors and promote neurogenic inflammatory pain within the olfactory epithelium. Using calcium imaging, previous experiments demonstrated a delayed TRPA1 response to the irritant cinnamaldehyde in comparison to the response obtained when applying other agonists such as capsaicin. Our objective for the present work is to elucidate the reason for this delay. In order to do this, Neurokinase 1 (NK-1) antagonist, L-732 138, and TRPA1 antagonist, HC030031, will be applied in a dose response method to neonatal mice olfactory epithelium tissue to indicate whether NK-1 plays a role in recorded responses to cinnamaldehyde. By blocking NK-1 and applying cinnamaldehyde, we expect to see no calcium release, therefore confirming that NK-1 activation is responsible for this delay. Also, we aim to measure plasma extravasation in the mouse olfactory epithelium after the application of the irritants cinnamaldehyde and capsaicin. Our expected result is that the application of irritants to the OE will promote the release of Substance P, resulting in plasma extravasation. Through this study, we will have a better understanding of the mechanisms by which neurogenic inflammation occurs. This will lead to studies on specific ways to avoid chronic inflammation.

CHEMICAL ENGINEERING & MATERIALS SCIENCE

INVESTIGATING THE EFFECT OF ADDING GRAPHENE NANOPLATELETS IN POLYMERS ON BARRIER PROPERTIES

Allyson Murray
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:00 PM
Poster: 94
Mentor(s): Lawrence Drzal (CMSC), Dr Frederic Vautard (CMSC)

The plastics used in the packaging industry are essential for preserving foods, drugs, and other products sensitive to their environment. While plastics are a barrier for various gases, they are only good for short term storage of food. Graphene nanoplatelets (GnP) are graphitic micron sized particles that are nanometers in thickness, high stiffness and strength values, and are impermeable to gases and vapors. The purpose of this research is to determine the effects of GnP within polycarbonate on the permeability of oxygen and water, and what size, amount and orientation of GnP is ideal for a nanocomposite film. Using 25 micron GnP particles, polycarbonate/GnP nanocomposite films samples were prepared including a control polycarbonate sample and 1%, 2%, 3% and 4% weight content of GnP. A lab scale extruder was used to melt and mix the polycarbonate and GnP together. The mix was then put into an injection molding system that made 25 mm plastic discs with a thickness of around 1.5 mm. The discs are compressed into films that are between .2 and .3 mm under a vacuum. The films were tested for oxygen permeability, and results indicate that by adding the GnP, the permeability does decrease with more GnP. Similar testing is being done using water vapor. Using a scanning electron microscope, the structure of the GnP within the samples will be determined as while as the size and orientation of the particles. The results will be compared with the percolation theory.

SYNTHESIS AND CHARACTERIZATION OF HYDROPHILIC POLYSILOXANES AND THEIR USE IN INTERPENETRATING POLYMER NETWORKS

Caleb Andrews
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:00 PM
Poster: 95
Mentor(s): Sudhanwa Dewasthale (Chemical Engineering and Material Science), Daniel Graiver (Chemical Engineering and Material Science), Ramani Narayan (Chemical Engineering and Material Science)

Well defined hydrophilic polysiloxanes were prepared from methyldimethoxy aminosilanes and ethylene carbonate. Unlike other silanes and polysiloxanes, these carbinol containing polymers are soluble in water and their solubility does not depend on the pH of the water or the molecular weight of the polymers. The preparation of the monomers and the polymerization kinetics were studied by FTIR, GPC and viscosity. These hydrophilic polysiloxanes were then used to prepare Interpenetrating polymer networks (IPNs) with silylated soybean oil. Although these polysiloxanes and the silylated soybean oil are immiscible, homogeneous compositions were prepared by emulsifying the soybean oil with aqueous solution of the polysiloxane. Upon evaporation of the water phase, homogeneous films were obtained composed of highly entangled polymer networks that prevented gross phase separation. Varying the ratio of the hydrophilic polysiloxanes to the hydrophobic soybean oil yielded IPN compositions with a wide range of physical properties ranging from a soft hydrophilic to rigid hydrophobic materials. Some of these compositions are suitable as anti-graffiti coatings, hydrogels, as well as paper and textile coatings. Work in underway with our industrial partners to utilize this technology as a basis for new commercial products.

EFFECT OF MINOR ELEMENT ADDITION ON THE SOLIDIFICATION OF HYPOEUTECTIC ALUMINUM SILICON ALLOYS
Eric Egedy
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:00 PM
Poster: 96
Mentor(s): Andre Lee (Material Science Engineering), Yang Lu (Material Science Engineering)

Aluminum alloys are made strong but their brittleness prevents them from being used in structural applications. If Aluminum alternatives were developed to replace steel then structures would be able to build cheaper and lighter structures. Aluminum Silicon (Al-Si) alloys casted, provide strong structures that are widely used because they are cost effective. Aluminum Silicon's low ductility is due to the growth of irregular silicon crystals during solidification. These irregular crystals promote crack initiation and propagation. In order to alter the silicon in the solidification process a chemical change must occur. Trace elements such as Na, Ca, and Sr are added to Al-Si alloys to cause the chemical changes necessary to increase ductility. Hypo-eutectic versions of the same alloy are also used to limit the amount of silicon in the structure. A visible difference within the microstructure of the alloy occurs after the solidification process this is believed to cause an increase in ductility without losing strength. Different applications of these trace elements and hypoeutectic Al-Si are tested and compared by each's microstructure, with a microscope, and Rockwell Hardness Value.

MECHANICAL PROPERTIES OF GLASS FIBER REINFORCED COMPOSITES IN RELATION TO DISSIMILAR MATERIAL JOINTS
William Terrell
Home Institution: Wright State University
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:00 PM
Poster: 97
Mentor(s): Arjun Tekalur (Mechanical Engineering), Aiswarya Venkadachalam (Mechanical Engineering)

This study aims to relate the mechanical properties of composite materials to the failure modes of dissimilar material joints. The funding for the research is provided by Army Tank Automotive Research Development and Engineering Center (TARDEC). Composite materials are manufactured in ACP Composites and Phoenix Composites. The research aims at predicting the mechanical properties of S2-glass and E-glass materials to determine the failure modes of dissimilar material joints. The investigation is limited to study the properties of glass reinforced materials. Carbon reinforced material properties are to be investigated in future. Experiments are carried out using Material Testing System (MTS) at room temperature. Mass production of vehicles demonstrates the relevance of this study. Understanding the mechanical behavior of composite-metal joints is essential to increase the integrity and strength of the structure. It also helps in cost reduction in the automotive industry. Composite material will be tested for predicting tension, compression, and shear properties of the material on three different loading fixtures. Each test requires a minimum of 3 similar experimental results to draw accurate observations from the data. From the experimental results, modulus of elasticity and other material properties in all three directions will be calculated. The modulus for instance, predicts how well material performs when subjected to higher rates of loading. We predict that mechanical properties will explain the relationship between the composite, type of joint, and the strength of the joint.

PRELIMINARY EVALUATION OF STEARIDONATE SOYBEAN OIL AS A SUBSTITUTE FOR LINSEED OIL IN ALKYD RESINS
Ana Goncalves, Julia Seixas Moraes
Home Institution: Federal University of Jequitinhonha and Mucuri Valleys, Federal University of Bahia
Category & Time: Chemical Engineering and Materials Science, Section 1, 1:00 PM - 2:00 PM
Poster: 98
Mentor(s): Daniel Graiver (Chemical Engineering and Materials Science), Ramani Narayan (Chemical Engineering and Materials Science)

Alkyd resins account for 60-70% of the polycondensation-based film-forming industrial coatings. The ecofriendly coatings are based on oxidation of natural oils containing unsaturated fatty acids such as Linseed oil. Although the use of vegetable oils as raw materials for industrial coating and painting applications has declined over the past decades, alkyd resins are still largely employed. The main goal of the present work was to evaluate alkyd resins derived from modified soybean oil that contains highly unsaturated Steradonic acid. The synthetic process we used was based on transesterification of the triglyceride oil with glycerol in the presence of a base catalyst followed by a reaction with phthalic anhydride in organic solvent. Key properties of the products, including iodine value, acid value, saponification value, color Gardner, specific gravity and viscosity, will be further evaluated and compared with the properties of conventional alkyds derived from linseed oil.

EFFECTS FROM SOLUTION ADDITIVE, PROCESSING TECHNIQUES, AND COMPOSITION ON INFILTRATED LSCF PARTICLE SIZE
Hongjie Tang
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:00 PM
Poster: 100
Mentor(s): Jason Nicholas (Chemical Engineering and Material Science)

Mixed Ionic Electric Conducting (MIEC) materials, particularly those in the LaxSr1-xCo-yFe1-y O3-δ (LSCF) family, are often utilized in Solid Oxide Fuel Cell (SOFC) cathodes. Some of the best performing SOFC cathodes are Nano-Composite Cathodes (NCCs) of LSCF nano-particles on Ionic Conducting (IC) scaffolds. NCCs are typically made by infiltrating, gelling and decomposing metal

nitrate solutions in sintered porous IC scaffolds. The MIEC particles produced by infiltration are typically 50 nm in diameter. This small size helps improve SOFC performance, especially at temperature below 600°C. The object of the present study is to determine, if, how, and why different solution additives, processing techniques, and LSCF composition affects infiltrated LSCF particle size. Here, scanning electron microscopy (SEM) and Williamson-Hall analysis of X-ray Diffraction (XRD) patterns will be used to determine LSCF particle size, Thermo-Gravimetric Analysis (TGA) will be used to analyze metal nitrate decomposition behavior, and Electrochemical Impedance Spectroscopy (EIS) will be used to characterize infiltrated NCC performance. Preliminary results show that solution additives have a major impact on the decomposition temperature of MIEC nitrate solutions. In addition, processing techniques such as desiccation and nano-GDC pre-infiltration reduce the LSCF particle size. These results suggest that MIEC nano-particle sizes can be controlled by various processing techniques, resulting in high performing, low temperature SOFC cathodes.

SOLVENT EFFECTS ON BIOMASS SWELLABILITY IN RELATION TO ENZYMATIC HYDROLYSIS

Mario Gutierrez
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:00 PM
Poster: 101
Mentor(s): David Hodge (Chemical Engineering and Materials Science)

One promising alternative to traditional petroleum energy products is the utilization of lignocellulose feedstocks for the production of renewable energy. However a key obstacle in the effective conversion of these feedstocks is the presence of lignin in the secondary cell wall, resulting in a recalcitrant and degradation-resistant cell wall structure. In order to improve enzymatic de-polymerization and increase enzyme accessibility in the cell wall, pretreatments are often utilized to disrupt the cell wall macrostructure. A potential prognosticator of enzymatic accessibility is Water Retention Value (WRV), which is a measurement of the capacity of an experimental biomass pad to hold water. Prior research examines the relationship between WRV and enzymatic digestibility as a predictive tool of biomass digestibility. However, WRV examines only the aspect of hydrogen bonding in relation to enzymatic accessibility, while other factors such as solvent molar volume in combination with hydrogen bonding may provide further insight into cell wall enzymatic interactions. The purpose of this study is to understand the effect solvents have on WRV by measuring WRVs across a series of water-solvent fractionated solutions. Swellability of two types of biomass feedstocks (corn stover and switchgrass, untreated and treated with alkaline hydrogen peroxide) was examined in the presence of different solvent environment. Solvents were chosen based upon hydrogen bonding capacity as well overall molar volume. Through this series of experiments, it was determined that WRV decreases as the fraction of solvent in solution increases. It was also determined that treated biomass achieves higher WRVs.

ENZYMATIC HYDROLYSIS YIELDS OF WOODY BIOMASS UNDER DIFFERENT ALKALI LOADINGS AND PEROXIDE ADDITION FOR THE PRODUCTION OF CELLULOSIC BIOFUELS

Benjamin Seely
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:00 PM
Poster: 102
Mentor(s): David Hodge (Chemical Engineering & Materials Science), Glen Li (Chemical Engineering & Materials Science)

As the cost of fossil fuels continues to increase, the search for alternative sources of energy continues. Biofuel is a suitable replacement for fossil fuels, but the cost of production makes it economically disfavored. The pretreatment process during biofuel production is an essential component when attempting to maximize yield. Cellulosic sugars can be produced from lignocellulosic biomass using a chemical pretreatment followed by an enzymatic hydrolysis. In this work, we investigated reaction conditions impacting catalyzed alkaline hydrogen peroxide pretreatment of hybrid poplar. Specifically for this set of studies, glucose yields of slow addition of hydrogen peroxide were compared against yields from one-batch addition during pretreatment. Tert-butylperoxybenzoate, a potential substitute for hydrogen peroxide, was also tested to compare yields against pretreatment with hydrogen peroxide. Additionally, we tested the effect of sodium hydroxide loadings on glucose yields in effort to minimize production cost of biofuels. Samples from enzymatic hydrolysis experiments were collected after 24 and 72 hours of enzymatic hydrolysis and analyzed through an HPLC column, where yields of the soluble components were determined. The results illustrate maximum glucose yields with the addition of 0.148 g of sodium hydroxide per gram of biomass. One-batch addition compared to slow batch addition of hydrogen peroxide gave inconclusive results when examining glucose yields. In Addition, the compound tert-butylperoxybenzoate gave much lower yields than hydrogen peroxide, implying the critical role of free hydroxyl radicals in the pretreatment of biomass.

THE EFFECT OF PH ON ENZYMATIC DIGESTIBILITY OF LIGNOCELLULOSIC SUBSTRATE IN COMPARISON TO MODEL PH STUDIES

Henry Pan
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:00 PM
Poster: 103
Mentor(s): Jacob Crowe (Chemical Engineering and Material Science), David Hodge (Chemical Engineering and Material Science), Daniel Williams (Chemical Engineering and Material Science)

Currently, the transportation sector comprises of 25% of the United State's total energy consumption. Current research aims to alleviate the oil dependency by utilizing lignicellulosic biomass to produce renewable biofuel. However, a key challenge for this

technology lies in the recalcitrant nature of the secondary cell wall. To overcome this obstacle, lignocellulsoic feedstocks are often pretreated, altering the cell wall macrostructure to improve enzymatic depolymerization. Another major obstacle in effectively converting of lignocellulosic feedstocks to fermentable sugars is effective depolymerization of polysaccharides in the cell wall. Among other factors, pH may heavily impact enzymatic activity. Current literature has examined the effect of pH on model cell wall compounds; however, application to lignocellulosic compounds may provide different results. The objective of this study was to examine the effect of pH on rate and extent of enzymatic depolymerization for both pretreated and untreated. Prior research has shown that a pH optimum may exist for effective enzymatic digestibility. However, these results may be substrate dependent. As a result, enzymatic digestibility was examined under a pH range of 4.5-6.5 for alkaline hydrogen peroxide pretreated corn stover. Kinetic rates of sugar conversion were determined at each pH, and compared to a model cellulose compound Avicel. In addition, while utilizing Novozymes based enzymes (CTEC and HTEC enzymes) for the majority of the study, Dupont enzymes (Accelerase 1500) were also examined to determine if different pH optimums exist for different enzymes interacting with lignocellulosic compounds, as prior research has shown when using model cellulose compounds.

THE EFFECT OF SILICA PARTICLE SIZE ON THE POROSITY OF HARD TEMPLATE, NON-PRECIOUS METAL CATALYSTS

Jacob Anibal
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 2, 1:00 PM - 2:00 PM
Poster: 104
Mentor(s): Nathan Leonard (Chemical Engineering and Materials Science), Scott Calabrese Barton (Chemical Engineering and Materials Science)

The hard templating method is a leading technique in the production of low cost, metal-nitrogen-carbon (MNC) catalysts to replace platinum in fuel cell cathodes. In the hard template method, the catalyst forms around fumed silica particles from a decomposing carbon-nitrogen precursor. The silica particles are then removed via acid or base washing, leaving a porous carbon catalyst with a pore structure expected to be very similar to the size and shape of the template silica particles. This work analyzes the effect of a silica template's average primary particle size on the pore size distribution of its catalyst. Four hard template catalysts with different silica templates were compared. Average diameters for the silica templates were obtained from literature values. Nitrogen adsorption isotherms for the catalysts were obtained to determine surface area and pore size distributions were obtained from the isotherms using the Barrett-Joyner-Halenda (BJH) and non-local density functional theory (NLDFT) techniques. The catalyst's main pore diameter was observed to be approximately half of the template silica's particle diameter. This relation suggests that the silica particle size plays an important role in catalyst pore development during hard template synthesis, but through an uncertain mechanism. Electrochemistry data was also taken for the catalysts to correlate pore size with catalytic activity toward oxygen reduction.

ENCAPSULATION OF HYDROPHILIC/HYDROPHOBIC IRON OXIDE MAGNETIC NANOPARTICLES IN BIOBLEND OF POLYSTYRENE AND POLY (LACTIC ACID) PARTICLES

Yi Ji
Home Institution: Michgan State University
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:00 PM - 3:00 PM
Poster: 106
Mentor(s): Ilsoon Lee (Chemical Engineering & Materials Science), Anna Song (Chemical Engineering & Materials Science)

Iron oxide (Fe2O3) magnetic nanoparticles (MNPs) have shown great promise for the use as tools in a wide variety of biomedical applications such as magnetic resonance imagining (MRI) contrast enhancement and drug delivery process. All the biomedical and bioengineering applications need high magnetization values and special surface coating of the magnetic particles, which has to be non-toxic and biocompatible. In our project, iron oxide MNPs were synthesized by co-precipitation method and coated with either hydrophilic citric acid molecules or hydrophobic oleic acid molecules on the surface for different applications. In addition, the applications require that these nanoparticles have overall narrow particle size distribution, so that the particles have uniform physical and chemical properties. In this project, size-selecting process for the coated MNPs was performed by selective precipitation technique and optimizing the ultracentrifugation parameters. Then the MNPs were encapsulated into bioblend of polystyrene (PS) and poly (lactic acid) (PLA) particles by emulsion diffusion process driven by viscous turbulent fluid flow, in order to allow a targetable delivery with particle localization in a specific area. The resulting particles were characterized by dynamic light scattering (DLS), scanning electron microscopy (SEM) and transmission electron microscopy (TEM) for size and shape analysis. In this presentation, I will detail the methods and results of our experiment, which demonstrate the relationship between the synthesis conditions and the morphological characteristics of the resulting particles.

TAILORING THE POROSITY OF METAL NITROGEN CARBON BASED CATALYSTS FOR POLYMER ELECTROLYTE FUEL CELL'S CATHODE

Nam Tran
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:00 PM - 3:00 PM
Poster: 107
Mentor(s): Scott Calabrese Barton (Chemical Engineering and Materials Science)

With high power density, high efficiency and simple design, polymer electrolyte fuel cells are being widely developed as an improved power source for transportation and portable power applications. However, the high cost of the catalyst is a significant barrier that prevents fuel cell from having more widespread use. Alternative catalysts, such as carbon based materials doped with

nitrogen and transitions metals (MNC catalysts) have been found to display outstanding oxygen reduction activity, superior conductivity and reasonable cost. Due to tunable pore size, high surface area, and high electrical conductivity, mesoporous carbons (MPC) are a strong candidate for MNC supports as they address transport limitations in non-precious fuel cell electrodes. MPC was successful prepared through soft template synthesis technique combining organic-organic self-assembly and removal of pore formers by pyrolysis. The porosity of MPC can be controlled by altering the carbon precursor and template ratio and pyrolysis temperature under drying condition.

GRAPHENE MEMBRANES FOR DESALINATION OF SEAWATER BY CAPACITIVE DEIONIZATION

Brandon Bocklund
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:00 PM - 3:00 PM
Poster: 108
Mentor(s): Lawrence Drzal (Chemical Engineering and Materials Science)

As the population continues to increase, the demand for potable water for consumption and production also increases. Current desalination technology, such as reverse osmosis, is expensive, energy intensive, and requires complicated infrastructure and maintenance. Recent research at Michigan State University has shown that inexpensive exfoliated graphene nanoplatelets (GnP) exhibit excellent electrical conductivity and flexural strength. GnP can be manufactured into sheets of paper with a simple water based process in which properties such as thickness and porosity can be controlled. By applying an electric potential, GnP papers assembled similar to a parallel plate capacitor can be used to adsorb ions in a continuous cycle to produce affordable desalinated water. This project will investigate the construction of GnP membranes and the design and operation of a laboratory scale capacitive deionization cell to evaluate the potential of GnP membranes to desalination of seawater. Variables to be investigated include: structure of the GnP paper, porosity, ion adsorption rates, effect of applied potential. GnP membranes have been prepared by a liquid suspension and filtration process. A design of the cell for measurements has been developed and fabricated. The instrumentation for measurement of the water conductivity has been procured and initial testing of adsorption capability has begun. The internal structure of the GnP membranes will be examined by scanning electron microscopy. The GnP paper will be modified by controlling the above variables to promote optimal adsorption capacity.

ELECTROSPUN RARE-EARTH METAL-OXIDE NANOFIBERS FOR DESULFURIZATION AT HIGH TEMPERATURE

Zachary Baumer
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:00 PM - 3:00 PM
Poster: 109
Mentor(s): Junghoon Yeom (Mechanical Engineering)

Thermochemical conversion of biomass residue to syngas has recently gained considerable attentions worldwide. Hydrogen sulfide and other sulfur-containing impurities produced during gasification pose environmental concern and deter the utility of syn-gas as a viable fuel source for many down-stream applications. Metal-oxide sorbents have shown a great promise at reducing the amount of sulfur in a stream of gas in low and medium tempertatures (200-400°C), but degrade at higher temperatures and with cyclic use. High temperature desulfurization is desired, because it is more thermodynamically efficient to maintain the gas' high temperature after gasification, and not cool down and reheat the gas for different processes. Rare-earth metal-oxides have shown unique chemistry with hydrogen sulfide and comparatively better thermal stability, but their slow kinetics hampers practical use. Therefore, in this paper, we want to exploit the nanosizing of rare-earth oxide (specifically lanthanum oxides and cerium oxides) sorbents to enhance sulfidation kinetics. Our approach to creating a nanostructure with a high surface area to mass ratio is to electrospin sol-gel based rare-earth oxide solutions into nanofiber mats. An electrospinning setup has recently been fabricated with a high voltage power supply and syringe pump, enclosed in an acrylic housing for safety. The electrospinning setup is controlled by an external voltage controller and monitor. Experiments are underway to reproduce nanofibers from literature procedures, as well as develop a new recipe and procedure specific to our own goal. In the next month, it is our objective to synthesize new nanofibers, characterize these fibers post-sintering, and begin carrying out sulfidation experiments using thermogravimetric analysis instruments.

INVESTIGATING THE FORMATION AND CORROSION INHIBITION IMPARTED TO AN ALUMINUM ALLOY BY A TRIVALENT CHROMIUM PROCESS (TCP) COATING

Yogesh Kumar Modi
Home Institution: National Institute of Technology Rourkela
Category & Time: Chemical Engineering and Materials Science, Section 3, 2:00 PM - 3:00 PM
Poster: 110
Mentor(s): Greg M Swain (Chemistry)

Aluminum alloys are susceptible to corrosion when exposed to the ambient environment. Inorganic coatings are often used to provide corrosion protection and to promote the adhesion of topcoats (primers and paints). The trivalent chromium process (TCP) coating is one such system. These coatings are formed by immersion and are available from several commercial suppliers. The various commercial coating baths have distinct chemical compositions such that it is important to understand the formation, structure and corrosion inhibition of each. In this work, we used electrochemical methods to study the corrosion inhibition of a Metalast TCP-HF conversion coating on an aluminium alloy (AA2024). Measurements were made in two naturally aerated electrolytes at room temperature: 0.5 M Na2SO4 (mild) and 3 wt.% NaCl (aggressive). Generally speaking, the conversion coating is 50-100 nm thick and consists mainly of hydrated zirconia (ZrO2.2H20). The electrochemical parameters studied were the open circuit potential, impedance-frequency spectra at the open circuit potential, linear sweep voltammetry to determine the polarization resistance, cathodic and anodic polarization curves to determine the corrosion currents and Tafel slopes.

EPOXY SURFACE MODIFICATION FOR SUPERHYDROPHOBICITY USING PLASMA TREATMENT
Ana Veskovic
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:00 PM - 3:00 PM
Poster: 112
Mentor(s): Per Askeland (Composite Materials and Structures Center), Lawrence Drzal (Composite Materials and Structures Center)

A superhydrophobic surface is characterized by high water droplet contact angles and low contact angle hysteresis. On a superhydrophobic surface, water droplets bead up and roll off even at low inclines. Superhydrophobic surface preparation techniques can be used to create water resistant and self-cleaning items for use in industrial, medical, and consumer applications. In order to be superhydrophobic, a surface must exhibit micro- or nanoscale roughness and consist of or be coated with a material with an inherently low surface energy. Plasma treatment utilizes plasma, which is an ionized gas, to physically and chemically break bonds at the surface of a material, forming smaller molecules which are then vaporized under vacuum. Plasma treatment can be used to selectively etch away microscopic layers of certain materials, such as epoxies, from a surface. This project builds upon the previous work of others and focuses on the use of oxygen plasma treatment to pattern microscale topographies onto epoxy surfaces, which can then be made superhydrophobic by being chemically treated to lower surface energy.

CONSTRUCTION AND OPTIMIZATION OF A HIGH PRESSURE FLOW ELECTROLYZER
Andrew Henika
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:00 PM - 3:00 PM
Poster: 113
Mentor(s): James Jackson (Chemistry)

Liquid Hydrocarbons are an excellent transport fuel due to their impressive energy to weight ratios; they're also the foundation of the modern chemical industry. Today we derive our hydrocarbon from fossil fuel sources and as we deplete and combust petroleum the CO_2 buildup that results pressures us to shift to fuels based on renewable carbon (i.e. biomass). In this project, we sought collaboration with bio-system engineering where biomass will undergo fast pyrolysis and generated a liquid product known as bio-oil. Bio-oil's chemical composition is energetically inferior to crude oil; it is highly oxygenated and contains a lot of acetic acid and therefore needs to be upgraded to be practical for use. These characteristics demise its potential as a transportation fuel candidate. Traditional Bio-oil upgrading to fuel is typically achieved by catalytic hydrogenation, using H_2 heterogeneously; the process requires however the high pressures (>100 psi), temperatures (>250 ^{0}C) and non-renewable nature of the H_2 make this energetically inefficient. Utilizing an electrocatalytic hydrogenation method the reaction takes place in solution at room temperature, negating the need for high pressure and temperature. The use of molecular hydrogen can be omitted because hydrogen is generated on the surface of electrode during electrolysis. When an unsaturated organic molecule is absorbed onto the catalyst surface near bound hydrogen atoms it can undergo hydrogenation by bonding with the hydrogen. This summer's project focuses on the influences of pressure and reaction chamber resonance time on the efficiency of the hydrogenation reactions.

NANOBIO SCIENCE: THE USE OF LAYER-BY-LAYER-ASSEMBLY TO CREATE PEM FILMS AND MEMBRANES FOR TIME-RELEASING DRUGS AND WATER FILTRATION
Kevin Taylor, Jr.
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:00 PM - 3:00 PM
Poster: 114
Mentor(s): Ilsoon Lee (Chemical Engineering and Materials Science), Oishi Sanyal (Chemical Engineering and Materials Science), Jing Yu (Chemical Engineering and Materials Science)

Relatively new emerging interdisciplinary researches are using experimental, computational, and theoretical techniques to produce, control, analyze and image bio-structures at the nano-scale for a wide variety of innovative applications. Our research mainly focuses on poly-electrolyte multilayer (PEM) structures, specifically polymer films and membranes. In our experiments we use a technique called Layer by Layer (LBL) assembly to create polymeric thin film structures. It consists of coating surfaces with positively and negatively charged poly-electrolytes one layer after another alternating after each poly-electrolyte solution. In the lab we study two different applications of the same process; one for water filtration, and the other for administering drugs on a time release basis. For the filtration aspect of our project the goal is to develop a membrane that filters impurities out of water at the fastest rate, i.e. the most efficient polymer structure to produce clean water. As for our more medically inclined research project the purpose is to create a porous polymer film that releases drugs into the body that fights against the development of harmful bio-films, in an initial large burst then at much slower constant rate until it is finished. In the presentation I will give a more detailed look at our research as well as its possibilities of revolutionizing human health.

CHARACTERIZATION OF DIMERIZED SOYBEAN OIL POLYOL BY TITRATION
Paul Harvey
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:00 PM - 3:00 PM
Poster: 115
Mentor(s): Hugh MacDowell (Chemical Engineering and Materials Science), Ramani Narayan (Chemical Engineering and Materials Science)

The main objective of this project is to characterize the functionality of dimerized soybean oil polyol to aid in polyurethane foam formulations. Sodium hydroxide (NaOH) with a molarity of .5M, 23g of acetic anhydride in tetrahydrofuran (THF), and phenolphthalein indicator were used to titrate the acid value (AV) and hydroxyl value (OHV) measured in milligrams of potassium hydroxide (KOH) per gram of substance (mg KOH/g). AV determines if the condensation polymerization reaction to synthesize the polyol was complete. The OHV determines the amount of the hydroxyl groups present in the polyol. Prior to testing, the mixture had an expected AV and OHV. Experiments will then take place to determine whether the mixtures are within a general range of 15-20% from the expected value via titration. The results from two samples of the mixture were the OHV's of 86.35 mg KOH/g and 174.96 mg KOH/g based on an AV of 10.80 mg KOH/g. These values are approximately 50% and 15% off of the expected value of 154.5 mg KOH/g.

USING YEAST DISPLAY AND FLUORESCENCE ACTIVATED CELL SORTING TO ENGINEER TROP2 SPECIFIC ANTIBODIES

Vince Kelly
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 4, 2:00 PM - 3:00 PM
Poster: 116
Mentor(s): Matthew Faber (Biochemistry), Tim Whitehead (Chemical Engineering and Materials Science)

My research focuses on using yeast display to engineer antibodies that bind specifically to Trop2, a protein which is over-expressed on the surface of human cancer cells. A mutant library of single-chain variable fragments (scFvs) of anti-Trop2 has been inserted into a DNA vector and transformed into host yeast cells. ScFv display is then induced using galactose-based growth media, and the cells are labeled with the antigen Trop2, as well as two fluorophores; anti-c-myc-FITC detects scFv display and streptavidin-phycoerythrin detects anti-Trop2 binding to Trop2. Fluorescence-Activated Cell Sorting (FACS) is then used to collect the top 2% of Trop2 binders. Four rounds of FACS sorting, followed by recovery and induction, have been completed, with each round showing distinct improvement in antigen-antibody binding to the point where, after the fourth FACS sort, around 20% of mutants show titratable antigen-antibody binding with strong phycoerythrin signal into the low hundreds of nanomolar Trop2, indicating antigen-antibody binding at those antigen concentrations. Following these sorts, error prone PCR was used to introduce random mutations into the plasmids encoding these mutants, and the plasmids were re-transformed into yeast. Further rounds of FACS sorting will be carried out in the same manner as before, and the binding patterns of individual mutants will be examined. By the end of the summer, we hope to have identified ten to fifteen individual anti-Trop2 mutants which bind to Trop2 at antigen concentrations in the tens of nanomolar.

CREEP BEHAVIOR OF FRICTION STIR WELDED ALUMINUM ALLOYS

Aaliyah Jeter
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 5, 3:00 PM - 4:00 PM
Poster: 118
Mentor(s): Carl Boehlert (Chemical Engineering and Materials Science), Uchechi Okeke (Chemical Engineering and Materials Science)

Aluminum alloys are typically used for automotive applications as well as aerospace and many other applications that are well known. Aluminum alloys are very high in strength and lightweight. This alloy, Al 2139 is being investigated for unibody applications. Aluminum alloys with copper do not weld well using conventional welding techniques. Friction stir welding of Aluminum alloys techniques was invented in 1991 and still being reviewed. It is a process of heat, plastic deformation and a chemical variation into the welded joints. This process changes the microstructure, strength, and ductility of the region being welded. Friction stir welding is both a deformation and thermal process that generates very high strains and strain rates. In this research, friction stir welding change the characteristic of the material in comparison to the base metal region. These were evaluated using a scanning electron microscope (SEM). The dynamic recrystallization of the grains after being welded will affect the precipitates in the material by using heat. The tensile test, one at 300C and previous lab work indicate that the precipitates are the main strengthening mechanism for this alloy

STRUCTURE-PROPERTY RELATIONSHIPS OF NEAR-INFRARED EXCITONIC SEMICONDUCTORS FOR TRANSPARENT PHOTOVOLTAICS

John Suddard-Bangsund
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 5, 3:00 PM - 4:00 PM
Poster: 119
Mentor(s): Richard Lunt (Chemical Engineering and Materials Science, Physics)

The development of efficient Transparent Organic Photovoltaics (TOPVs) is an exciting pathway to energy scavenging electronics and energy efficient buildings. For example, flexible TOPV laminates could be easily retrofitted on the windows of buildings or automobiles or integrated into the screens of mobile electronics to charge devices during use. Current TOPVs exhibit power conversion efficiencies between 2-4%, but have the potential to be greater than 10%. One of the most promising routes to improving these efficiencies is to find electron donor materials with absorption deeper in the near-infrared (NIR) region. State-of-the-art TOPVs currently harvest wavelengths up to 800 or 900 nm, leaving over half of incident NIR photons unutilized. Here we aim to expand this range by examining the photophysical, electrical, and structural properties of a series of new NIR sensitive polymethine derivatives with absorption past 900 nm. We connect the photophysical properties to photovoltaic performance through the optimization of layer thicknesses, annealing, and blended heterojunction structures. We also explore counterion exchange and

modification of the molecular structure as means to control packing, surface structure, absorption peak and breadth, and photovoltaic performance. Ultimately, these molecules could be deployed in efficient transparent multijunction photovoltaics.

ORIENTATION AND GAS PERMEATION IN BLOWN FILMS OF HDPE/ORGANOCLAY NANOCOMPOSITE FORMULATIONS

Jonathon Knedgen
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 5, 3:00 PM - 4:00 PM
Poster: 120
Mentor(s): K. Jayaraman (Chemical Engineering and Materials Science), Weijie Ren (Chemical Engineering and Materials Science)

The oxygen permeability of polymer films is of great importance, especially in packaging applications where oxygen can have detrimental impacts on a product. While plastic films provide suitable resistance to oxygen permeation, their efficacy can be greatly improved by the addition of nanoparticles into the polymer matrix; these particles increase the tortuosity of the path gas molecules must travel to pass through the polymer film. In this study, layered silicates, a type of nanoclay, were melt compounded with high density polyethylene (HDPE) to prepare nanocomposites. To improve the compatibility between the nonpolar HDPE and organoclay, maleic anhydride grafted polyethylene (PE-g-MA) was used as a compatibilizer. The organoclay was further modified with different silane coupling agents to strengthen the polymer-particle interactions within the system and improve particle dispersion. The nanocomposites were characterized with X-ray Diffraction on compression molded specimens to study the state of particle dispersion. Extrusion blown films 15 to 25 microns thick were made from the compounds. These films were characterized for nanolayer orientation first with a Prism Coupler and then tested for oxygen transmission or permeability using a Mocon OXTRAN Model 2/21. Thus the effects of using different coupling agents and different film blowing conditions, on the extent orientation in the film and the barrier properties of the film, were investigated.

DEVELOPING AND UNDERSTANDING MONODISPERSE EMULSIONS IN MICROFLUIDIC DEVICES

Matt Schweiger, Eric Miller
Home Institution: Michigan State University, University of Michigan
Category & Time: Chemical Engineering and Materials Science, Section 5, 3:00 PM - 4:00 PM
Poster: 121
Mentor(s): Maddalena Fanelli (Chemical Engineering and Material Sciences), Peter Lillehoj (Mechanical Engineering)

Microbeads have many useful applications in the pharmaceutical and biomedical fields. Because of their hydrophilic nature, calcium alginate microbeads are especially useful as carriers of biological cells, drugs, and vaccines. Microbeads can be formed by creating droplets of an aqueous solution of sodium alginate in a continuous phase of soybean oil. The droplets are then exposed to a solution containing calcium ions, where crosslinking occurs and calcium alginate microbeads are solidified. This study attempts to characterize and optimize the production of monodisperse calcium alginate beads by way of external gelation on a microfluidic chip. Various parameters are explored, including microchannel configuration, concentrations of sodium alginate and surfactant, and fluid flow rates. Microfluidic configurations were designed using AutoCAD 2014. With the appropriate parameters, microdroplets of varying size were formed at consistent rates and solidified into calcium alginate microbeads.

AGAROSE SCAFFOLD FABRICATION AND PROTEIN RELEASE FROM LAYER-BY-LAYER ALGINATE HYDROGEL

Rachel Schuldt
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 5, 3:00 PM - 4:00 PM
Poster: 122
Mentor(s): Jeffrey Sakamoto (Chemical Engineering and Material Science), Dena Shahriari (Chemical Engineering and Material Science)

Currently there are no therapeutic methods to regenerate damaged nerve tracts after spinal cord injury. Previously, multifunctional 1.8 X 1.8 X 2 mm scaffolds have been developed that can be surgically implanted into the body to promote and guide axonal regeneration through their linear channels (Stokols et al, 2006). These scaffolds were developed through a templating process to fabricate 3wt% scaffolds that, when placed *in vivo*, showed linear regeneration, but showed scar tissue. We have hypothesized that lower weight percentages of these scaffolds would prevent scar tissue due to a decrease in the mechanical stiffness of the hydrogel. Modifying the weight percentage impacts the pore structure of the hydrogel. The porosity of hydrogel is crucial in enabling sustained release of protein for drug delivery, which is essential in axon regeneration. Previously, we have shown layer-by-layer (LbL) on large hydrogel samples can sustain protein release. It is hypothesized that the sustained protein release of the smaller 2 X 2 X 2 mm hydrogel samples will be equivalent to the larger hydrogel samples once the volume of the samples are normalized. This sustained release is achieved through the LbL process by temporarily encapsulating the protein at a stable pH=5. When exposed to a pH=7 in the body the layers are able degrade layer-by-layer leading to the sustained release of the protein that is quantified throughout the degradation process.

PEROVSKITE SEMICONDUCTOR FILMS FOR PHOTOVOLTAIC APPLICATIONS

Juan Mena Lapaix
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 6, 3:00 PM - 4:00 PM
Poster: 124
Mentor(s): Richard Lunt (Chemical Engineering and Material Science, Physics)

For more than three decades, photovoltaic (PV) cells have been investigated with the purpose of harvesting solar energy, a highly abundant source of clean energy, to convert it directly into usable electricity. However, adoption has been limited by high costs associated with high-temperature processing, utilization of low-abundance materials, or toxicity of component materials. In recent years, perovskite-based solar cells have emerged as an attractive alternative due to their simple fabrication process and the high abundance of their constituent materials. Here we present perovskite thin films made using AMX_3 perovskites, where A is a 1+ cation, M is a 2+, and X is a halogen anion. Simple-structured PVs without lead have already been prepared with these films, producing devices with moderate efficiencies. Ultraviolet-Visible (UV-vis) spectroscopy studies of several of these films show tunable bandgaps and absorption extending from 800 nm to 500 nm, a range which encompasses most of the visible spectrum. It has been shown that with optimal processing, perovskite structures have potential to yield devices reaching efficiencies of over 15%. The exceptional potential of these materials in high-efficiency and low-cost PVs warrants the need for further research.

BIOFUEL PRODUCTION USING LIGNOCELLULOSIC ENZYMES

Matthew Smith
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 6, 3:00 PM - 4:00 PM
Poster: 125
Mentor(s): Carolyn Haarmeyer (Chemical Engineering), Timothy Whitehead (Chemical Engineering)

As the amount of oil in the world diminishes, biofuels offer a suitable alternative for use of energy. Lignocellulosic biomass is a promising avenue for biofuel production due to the simplicity of production. Cellulases are key enzymes in the lignocellulosic biofuel production process. Cellulases are enzymes that break down cellulose into glucose which can be fermented into biofuels, such as ethanol. Cellulases are difficult to reuse because they bind to lignin, a biopolymer found in biomass. To increase recyclability and ultimately lower the cost of these cellulases, we are trying to determine a relationship between cellulase surface properties and lignin binding. We will first develop this relationship using green fluorescent protein (GFP) as a model. To do this we are creating mutant GFP with different surface properties in hopes to develop trends that describe GFP-lignin binding. To test these mutant proteins for lignin binding, a reproducible binding assay was developed that shows consistent results for the wild type GFP. The expression and extraction of GFP was optimized to ensure that protein was not lost during the entire process. By the end of the summer, we will have tested well over 200 mutants, which will be used to populate a phase diagram correlating intrinsic protein surface properties with lignin binding. This phase diagram will allow us to create mutant cellulases with low lignin binding, and high recyclability. The increased recyclability of these mutant cellulases will reduce cost of biofuel production.

METHODS OF ISOMER SEPARATION FOR DOUBLE DECKER SILSESQUIOXANES

Marissa Beatty
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 6, 3:00 PM - 4:00 PM
Poster: 126
Mentor(s): Gayanthi Attanayake (Chemistry), Andre Lee (Chemical Engineering and Material Sciences), Robert Maleczka (Chemistry)

This study examined various methods that can be used to separate double decker silsesquioxanes (DDSQ) isomers. Isomers of DDSQs have demonstrated differences in physical properties, thus high purity of the isolated isomers is crucial for synthesis of experimental compounds. The various isomers explored included cis and trans isomers of compounds bearing either meta-aminophenyl or para-aminophenyl methyl moieties. Separation of the cis and trans isomers was regioisomer dependent and it was observed that cis isomers were notably more soluble in a solution of THF and hexanes than the trans isomers. Due to this variance in solubility, fractal crystallization methods were utilized in order to precipitate out the trans isomer. While this method allowed for high purity of the trans isomer, large amounts of the trans starting material remained in solution, which greatly compromised our ability to obtain the cis isomer in high purity. Further isolation of each isomer was investigated using silica gel column chromatography. This method of purification enabled the separation of substantially purer m- and p- aminophenyl isomers. Purity of the final isolated isomers was verified using proton nuclear magnetic resonance (NMR), silicon NMR, and differential scanning calorimetry (DSC).

NANO SPHERE LITHOGRAPHY

Jared Gaumer
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 6, 3:00 PM - 4:00 PM
Poster: 127
Mentor(s): Junghoon Yeom (Mechanical Engineering)

Colloidal particles that self-assemble into ordered, close-packed two dimensional monolayers have attracted much attention due to the many potential applications including surface enhanced Raman spectroscopy, nanosphere lithography, and photonic crystals. Well ordered, 2D colloidal crystals can be formed by spin-coating, convective assembly, or simply drying over a flat surface. However during the self-assembling process, the particles are subject to a high degree of crystal defects such as grain boundaries, multi layers, and areas of no deposition. It is in the interest of this research to minimize these defects in the assembly process. Here we are investigating how the evaporation rate coupled with the use of an acoustical shear force will influence the coherence of the assembly process. A simple deposition chamber along with a larger enclosure to control humidity has been constructed to assist the self-assembly process. Polystyrene nanospheres (500nm) suspended in an aqueous solution are deposited onto silicon coupons in an ~ 1cm in diameter ring. The overall quality of the deposited particles is highly dependent on the local evaporation rate, which

influences the meniscus shape and receding speed of the drying front. The acoustic vibration is then applied to the silicon substrate by a thin-film piezoelectric actuator. It is anticipated that the amplitude and frequency of the vibration can modulate the shear force acting upon the nanospheres to mechanically anneal the drying films, resulting in a defect-free domain. This will allow for the fabrication of more predictable and reproducible nanostructures that possess predictable physical properties for myriad applications.

DESIGN AND ENGINEERING OF NOVEL BIO-BASED POLYMER TECHNOLOGIES

Kylash Sivakumar
Home Institution: Michigan State University
Category & Time: Chemical Engineering and Materials Science, Section 6, 3:00 PM - 4:00 PM
Poster: 128
Mentor(s): Hugh Macdowell (Chemical Engineering and Materials Science), Ramani Narayan (Chemical Engineering and Materials Science), Jeff Schneider (Chemical Engineering and Materials Science)

Bio based polymers were explored for use in foam and thermoplastic technologies. Flexible polyurethane foams were made up to 50% bio based content to match the characteristics of existing petroleum based foams. The reaction was performed with 4,4′-methylenediphenyldiisocyanate (MDI) and a blend of dimerized soybean oil polyol with petroleum polyol. Upon increasing the bio based content of the polyol blend, the formulation of the foam was changed to accommodate for the reactivity of the dimerized soybean oil polyol. Another bio based technology investigated was the synthesis of thermoplastic elastomers (TPE) from acrylated epoxidized soybean oil (AESO) and vinyltrimethoxysilane (VTMS) using azobisisobutyronitrile (AIBN) as an initiator for free radical polymerization. The thermoplastic nature would allow for reprocessing and recycling of the TPE in a commercial process. The TPE can be exposed to moisture to crosslink silanes in the material to form a thermoset with siloxane linkages. The functionality of AESO was determined through HNMR analysis and was lowered by reacting 3-aminopropyltriethoxysilane (APTES) with AESO to terminate acrylate groups before reacting with VTMS. Biodegradable polyester chemistry has also been investigated, specifically using polylactide (PLA) and polycaprolactone (PCL). The copolymerization of PLA and PCL results in a heterogeneous thermoplastic due to the differences in morphology and thermodynamic properties. The addition of a tie layer allows PLA and PCL to be chemically bound to form a homogenous thermoplastic copolymer that can be synthesized through a continuous reactive extrusion process.

CIVIL & ENVIRONMENTAL ENGINEERING

IMPACT OF SITE FACTORS ON THE EFFECTIVENESS OF RIGID AND FLEXIBLE PAVEMENT PRESERVATION TREATMENTS

Nicholas McDonald
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 130
Mentor(s): Ronell Eisma (Civil and Environmental Engineering), Syed Haider (Civil and Environmental Engineering)

Pavement preservation has become a common practice in the management of pavement network across the country. However, the effectiveness of the preservation treatment vary depending on numerous factors e.g., construction practices, traffic, climate and preexisting surface conditions. The purpose of this research is to determine the impact of themsite factors on the effectiveness of rigid and flexible pavement preservation treatments. The data from the Long-Term Pavement Performance (LTPP) database contains two experiment studies (i.e., SPS-4 and SPS-3). The SPS-4 and SPS-3 experiments compare the effectiveness and mechanisms by which the selected rigid and flexible preservation treatments preserve and extend pavement service life, safety, and ride quality, respectively. Joint seal and joint seal with under seal treatments are considered in the SPS-4 experiment while slurry seal, chip seal, crack seal, and thin overlay are the preservation treatment in the SPS-3 experiment. The service life extension (SLE) is a measure of treatment effectiveness and can be obtained by comparing the performance between treated and untreated control pavement section. The rigid pavement performance measures to be evaluated are cracking, faulting and roughness. The flexible pavement performance measures to be considered are rutting and roughness. The treatments effectiveness will be evaluated by first determining the SLE for different preservation treatments applied in different states. Subsequently, the impact of various site variables (traffic, climate and pre-existing conditions) will be obtained by performing statistical analyses including analysis of variance (ANOVA) and multiple linear regressions. The SLEs for each pavement section (i.e., the treatment) will be compiled

EVALUATION OF FLEXIBLE PAVEMENT PRESERVATION TREATMENTS EFFECTIVENESS

Gilchrist Ireland
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 131
Mentor(s): Ronell Eisma (Civil and Environmental Engineering), Syed Haider (Civil and Environmental Engineering)

Highway pavement deteriorates over time because of traffic loads and environmental variations. There are two way to mitigate pavement deterioration depending on the timing of the fix. A treatment applied to existing pavement at an early age to prevent damage encompass preservation strategies while a repair performed at later age to correct the pavement distresses are part of the rehabilitation actions. The preservation treatments are non-structural in nature while the rehabilitation fixes increases the existing structural capacity of the pavement. Therefore, rehabilitation treatments generally involve higher construction and user cost than the preservation actions. While the preservation treatments will extend the existing pavement service life, the service life extension

(SLE) will depend on several variables. These variables include performance measure, treatment type, pre-existing surface conditions, traffic levels, and climate. This study will investigate the impact of the variables on SLE for various preservation treatments. The Long Term Pavement Performance (LTPP) database is the major source of data for accomplishing the objectives of the study. The LTPP SPS-3 experiment compares the effectiveness of several flexible pavement preservation treatments. The preservation treatments applied were slurry seal, chip seal, crack seal, thin overlay, and an untreated control. The objective of this research is to evaluate the effectiveness of each flexible pavement preservation treatments.

DAMAGE ASSESSMENT USING SELF-POWERED WIRELESS SENSORS

Anand Bhattad
Home Institution: National Institute of Technology Karnataka
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 132
Mentor(s): Amir H Alavi (Civil and Environmental Engineering), Hassene Hasni (Civil and Environmental Engineering), Nizar Lajnef (Civil and Environmental Engineering)

Recently, wireless sensors have received a significant attention for structural health monitoring. A notable improvement in design of conventional wireless sensors is the utilization of piezoelectric transducers for self-powering of these devices. This is achieved by harvesting energy from the mechanical loading experienced by the structure. A major constraint in the implementation of the self-powered wireless sensors pertains to a considerable loss of the sensed information. In this study, a series of experiments are conducted to develop a long-term piezoelectric-based monitoring system. To this aim, several self-powered wireless sensors are installed on steel plates with different notch sizes and their responses due to cycling loading are recorded. Various configurations are considered for the sensor number and locations. Extensive analyses are performed to interpret the limited but valued data generated by the self-powered wireless sensing technology for different damage scenarios and establish a logical relationship between the obtained responses and the progressive damage. Besides, the results of the experimental study are compared with those obtained from an array of resistance strain gauges, as well as the results from a 3D finite element analysis utilizing Abaqus computer software.

SENSITIVITY ANALYSIS OF GENE-Z™ TO DETECT ENVIRONMENTAL DNA OF HIGH-RISK INVASIVE SPECIES IN THE GREAT LAKES AREA

Cathrine Kronlein
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 133
Mentor(s): Syed Hashsham (Civil and Environmental Engineering)

The early detection of high-impact aquatic invasive species is an important research priority because their prevention is typically more effective than their removal. Traditional detection approaches includes sample filtration and laboratory-based PCR and are time-consuming and costly. New field-based molecular /genetic technology approaches are more rapid and less expensive than traditional approaches. A sensitivity analysis of a developed hand-held gene analyzer (termed Gene-Z™) compared to the traditional detection approach was performed on lake samples collected from throughout Michigan. Gene-Z™ uses isothermal amplification for genetic detection of e-DNA (environmental DNA) in the field. Low cost, microfluidic DNA chips were used to carry out 64 assays in parallel. The lake water samples were tested for 6 high risk potential invasive species (*Limnoperna Fortunei, Daphnia cristata, Cercopagis pengoi, Hydrilla verticillata, Dikerogammarus villosus, Channa argu)* and surrogates. Dilutions of lake water samples were tested with a commercially available platform, Biorad, and will be compared to Gene-Z™. Time to positivities obtained initial tests ranged from 10-45 minutes depending on target concentrations. In future experiments, results are expected to show similar amplification times and sensitivities between the two methods. The ability of the microfluidic chips to hold higher sample volumes allows for the increased sensitivity that is expected over available equipment. This work is funded through the Environmental Protection Agency Great Lakes Restoration Initiative (EPA GLRI) grant number GL-00E01127-0.

DETECTION LIMIT OF ENVIRONMENTAL DNA USING GENE-Z: A COMPARISON OF SAMPLE PREPARATION METHODS

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

Environmental DNA methods show great potential for inexpensive and rapid early detection of invasive species in rivers and lakes. Current molecular detection techniques include Polmerase Chain Reaction and, more recently loop mediated isothermal amplification (LAMP). The Gene-Z is a point of care environmental DNA detection device in development that uses LAMP for rapid diagnostics. There is currently a gap in knowledge about the environmental DNA detection limit for LAMP and specifically Gene-Z. A major goal of this study is to determine the detection limit of LAMP for three different sample preparation methods. In the first method, DNA is extracted from environmental water samples and amplified through Gene-Z. The second method uses a dry, whole cell environmental sample that is then added to the Gene-Z with no additional preparation. In the third method, whole cells are filtered out of a water sample and then added directly to the Gene-Z. The resulting amplification curves will then be analyzed and visualized to determine the presence/absence of particular gene sequences. A dilution series will then be used to determine the detection limit of each of the above methods. The resulting data will then be compared to determine the detection limit of each

method. Knowing the detection limit will reveal how much water must be sampled to determine the presence or absence of organisms in a given body of water.

DETECTION, ANALYSIS AND QUANTIFICATION OF INVASIVE SPECIES USING ENVIRONMENTAL DNA AND GENE-Z

Nazarine Nato
Home Institution: Benedict College
Category & Time: Civil and Environmental Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 136
Mentor(s): Syed Hashsham (Engineering)

Rapid detection at lower abundances of environmental DNA (e-DNA) corresponding to low infestations of invasive species is crucial in preventing and eradicating the invasion at an early stage. It is also relatively less expensive compared to traditional approaches e.g., expert survey and scuba diving, for detection of invasive species. In this study, Gene-Z, a portable nucleic acids analysis device was used to measure the abundance of invasive species using an isothermal approach targeting their e-DNA marker. Primers targeting specific genes characteristic to *Hydrilla* (NADP- dependent malic enzyme) were designed using Primer Explorer software. Primers were synthesized by IDT (Integrated DNA Technologies) and dispensed into the microfluidic chips with 10-25 µl well sizes. Time to positivity (time at which the signal to noise ratio crosses the threshold of 3 or 10) and lower limit of detection was measured for *Hydrilla* DNA spiked in distilled de-ionized water to result in 10^{1} to 10^{-7} µg/ml concentration. The amplification was noted to be consistent to 10^{-2} µg/ml. Additional experiments will be conducted to compare the efficiency of DNA polymerase (Lucigen Corporation) and Bst Polymerase 2.0. Further experiments will be conducted to enhance the limit of detection with the goal of early, rapid detection of the potential invasive species at lower concentrations in order to protect the Great Lakes.

AN APPROACH FOR PREDICTING TEMPERATURES IN FIRE EXPOSED STEEL STRUCTURES

Bruno Rocha Mota
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 137
Mentor(s): Venkatesh Kumar R Kodur (Civil and Environmental Engineering), Mohannad Zeyad Naser (Civil and Environmental Engineering)

Steel structures when exposed to fire experience loss of strength and stiffness with time of fire exposure, which will lead to lower fire resistance in steel structures. To evaluate fire resistance of steel structural members, temperatures in the cross section of the member are required. Recently, Dwaikat and Kodur developed a simplified approach utilizing basic heat transfer principles to evaluate temperatures in steel members. This paper uses simulation to compare temperatures from current literatures. The proposed approach can be used to predict steel temperature for both protected and unprotected sections, at any given time, without the need for incrementing time steps. This is an advantage over advanced methods such as three-dimensional finite difference equations whose accuracy is dependent on the size of time increment used. The modified Dwaikat and Kodur's approach is compared against "Best-fit" and "Lumped Heat Capacity", which are based on experimental data and statistical regression. More than 5,400 data points were generated, including 30 different W sections, exposed to ISO 834 and ASTM E119 standard fire. The former predicts good results for both protected and unprotected steel sections, the simplicity of the proposed method makes it attractive for use in design situations.

IMPACT OF DIAMOND GRINDING ON RIGID PAVEMENT SMOOTHNESS AND AXLE LOADING

Tyler Frederick
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 138
Mentor(s): Ronell Eisma (Civil and Environmental Engineering), Syed Haider (Civil and Environmental Engineering), Imen Zabaar (Civil and Environmental Engineering)

Highway pavement networks are expected to deteriorate over time as a result of variations in traffic loading and environmental conditions. Highway agencies have established systems of rehabilitative and preventive repair strategies to address pavement deterioration. Rehabilitative pavement treatments increase structural capacity and are applied in response to existing pavement damage. In contrast, preventive treatments are applied early in the life of a pavement to improve functional capacity and mitigate further distress propagation. Preservation treatments are preferable as they reduce both construction and roadway user costs. The surface roughness in terms of International Roughness Index (IRI) captures variation in vertical surface elevations along the pavement length. Diamond grinding is a rigid pavement preservation treatment which is typically utilized to increase pavement smoothness by eliminating the surface undulations. The focus of this study is to evaluate the impact of diamond grinding on pavement smoothness and axle loads. The effectiveness of a diamond grinding can be assessed by evaluating the IRI before and after the treatment. Generally, smoother pavements will have lower IRI, which will result in lesser vehicle body and axle bounce. Consequently, the pavement will be subjected to lower dynamic loads which may cause lesser pavement damage or vice versa. To test the above mentioned hypothesis, data from the Long-Term Pavement Performance (LTPP) database will be utilized to evaluate the impact of diamond grinding on pavement performance.

EVALUATING CROSS SECTIONAL TEMPERATURES OF FIRE EXPOSED CONCRETE MEMBERS
Abhishek Master, Abhishek Salkar
Home Institution: National Institute of Technology Karnataka Surathkal, India
Category & Time: Civil and Environmental Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 139
Mentor(s): Ankit Agarwal (Civil and Environmental Engineering), Venkatesh Kodur (Civil and Environmental Engineering)

In order to evaluate the fire resistance of reinforced concrete members, temperature across the cross section of the member becomes critical. Design graphs are available in codes and standards such as ACI and Eurocode, where the methods have been codified to determine cross sectional temperatures. A review of literature indicates that only a few empirical formulae have been developed in the past to obtain temperature profiles under standard fire conditions. However, these formulae are only applicable for specific types of concrete, and using them for other concrete mixes can induce errors in results. Recently, an improved simplified approach has been developed by Kodur et al. for evaluating cross sectional temperatures in reinforced concrete members. The approach is derived through statistical non linear regression analysis using data generated from finite element analysis. As part of current work, cross sectional temperatures predicted by Wickstrom's approach and Kodur et al. were compared for various concrete structural members exposed to standard fire conditions. The members included concrete beams, columns and slabs of varying dimensions. The comparative study indicated that the Kodur et al approach constantly predicted higher temperatures at mid depth of the concrete beam. At rebar level, the temperatures predicted by Wickstrom's approach were lower up to some point of time, after which the temperatures predicted by Kodur et al approach surpassed those predicted by Wickstrom's approach, and the difference between the two kept increasing with time.

A PREDICTIVE EQUATION FOR ESTIMATING RUTTING RESISTANCE OF ASPHALT MIXTURES FROM VOLUMETRICS
Adam Chludzinski
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 141
Mentor(s): Anas Jamrah (Civil and Environmental Engineering), M. Emin Kutay (Civil and Environmental Engineering)

Asphalt rutting (permanent deformation) is one form distress for pavements resulting from repeated cycles of traffic loading and unloading at relatively high temperatures. Currently, the Superpave mix design method is based on the volumetrics of the asphalt mix and there is no requirement for a rut resistance performance test at the mix level. The Asphalt Mixture Performance Tester (AMPT) can be used to determine the flow number and corresponding accumulated microstrains for an asphalt mix sample but these tests are timely and expensive to prepare and test samples for a range of mix designs. This study was done to develop a regression model using IBM's SSPS statistical software that would input certain variables from the Superpave mix design and output permanent strain. This model can then be applied to any mix design and predict how it will deform before the fabrication of the asphalt mix at the plant.

THE IDENTIFICATION OF ISOLATES CAPABLE OF CONTAMINANT BIODEGRADATION
Jordyn Davis
Home Institution: Michigan State University
Category & Time: Civil and Environmental Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 142
Mentor(s): Alison Cupples (Environmental Engineering), Fernanda Paes (Environmental Engineering)

The explosive hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) has caused significant soil and groundwater contamination. To remediate these sites, there is a significant need to determine which microorganisms are responsible for RDX biodegradation to enable the appropriate planning of bioremediation efforts. Bioremediation is an emerging technology that uses microorganisms to remove pollutants or reduce them to less toxic substances in an economical and eco-friendly manner. Identifying microorganisms able to degrade such chemicals is important because their presence within contaminated water and soil bodies could minimize impacts on human and environmental health. The overall goal of our research is to identify isolates able to degrade RDX. For this study, 5 isolates were selected and incubated in microcosms containing minimal mineral media and 20 ppm of RDX. RDX concentrations were monitored over time using HPLC and DNA was isolated from each culture using the ultraclean microbial DNA isolation kit from Mobio. Overall, degradation of RDX occurred in a period of 57 days and RDX final concentrations ranged from 0.2-5.9 ppm. Extracted DNA concentrations from the isolates ranged from 9.9-20.9 ng/µL. Current research involves PCR for the construction of 16S rRNA gene clone libraries using the TOPO TA cloning kit from Invitrogen. The sequencing of these libraries will enable the identification the RDX degrading isolates. This research has the potential to contribute to RDX bioremediation efforts through the design of molecular probes targeted to these microorganisms.

IDENTIFYING PARSIMONIOUS STATISTICAL MODELS FOR ESCHERICIA COLI LEVELS AT FRESHWATER BEACHES IN LAKE MICHIGAN
Sunayana Nayak
Home Institution: People's Education Society Institute of Technology
Category & Time: Civil and Environmental Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 143
Mentor(s): Phanikumar Mantha (Civil and Environmental Engineering)

Water quality at recreational beaches continues to be a cause for concern as exposure to bacteria, viruses and protozoan parasites in nearshore waters is known to cause a range of diseases in swimmers including gastro-intestinal illness. The current practice of beach monitoring follows the traditional method of culturing faecal indicator bacteria such as E. coli; however, the assays require 24 to 48 hours while water quality at beaches is known to change quickly within a short time (e.g., in a few hours). Predictive models are attractive tools for producing near real-time forecasts and maybe more reliable than current approaches based on sampling and culture-based methods. In this research, several models including linear and nonlinear models with and without interactions among explanatory variables were created using data collected for three consecutive summer months in 2008 at the Ogden Dunes beaches along the Lake Michigan shoreline in Indiana. To minimize efforts in collecting data and developing models and to maximize the use of models by beach managers, parsimonious models were identified by using the Akaike Information Criterion (AIC). The general model created included 9 variables but the models created for individual beaches included just two variables and were found to give better prediction of bacterial levels.

DURABILITY OF CONCRETE IN COASTAL AREAS

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Home Institution: National Institute of Technology Karnataka Surathkal, India
Category & Time: Civil and Environmental Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 144
Mentor(s): Venkataramana Katta (Civil and Environmental Engineering)

The Indian code of practice for plain and reinforced concrete (IS 456:2000) specifies that the minimum compressive strength of concrete in Reinforced Cement Concrete works, to achieve desired durability, shall be minimum of 30 MPa in coastal areas. However, durability is a measure of permeability of concrete, rather than its strength. Higher strength does mean denser concrete, and thus, strength is indirectly related to durability. On the other hand, the same level of permeability of concrete can be achieved in concrete mixes of compressive strength 30 MPa and 25 MPa, depending upon the micro structure of concrete. In the present research, an exploratory study is conducted to delink durability and strength of concrete. Concrete specimens (specimens in the form of cubes and slabs) of compressive strength 30 MPa and 25 MPa blended with 70% content of Ground Granulated Blast Furnace Slag were tested using newly introduced “Permit Ion Permeability Test Apparatus”. Chloride ion permeability values for 28th day, 56th day and 90th day were determined experimentally. The results obtained were inconclusive and this study needs further investigation using other blends before generalization. If this research succeeds to delink durability from strength, consequently leading to substantial savings in consumption of cement, the specifications in IS 456:2000 regarding durability requirements can be reconsidered. It is expected that the present research will provide significant contributions by reducing carbon foot prints due to lesser consumption of cement.

COMPUTER SCIENCE & ENGINEERING

OPTIMAL CONSUMER DECISION FUNNELS FOR GENERAL MOTORS USING MARKOV BRAINS

Zoe Beckett
Home Institution: Oberlin College
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 146
Mentor(s): Arend Hintze (Computer Science and Engineering), Randy Olson (Computer Science and Engineering)

Automobile consumers were surveyed on the steps they took before deciding whether or not to buy a car. The results from this survey must be run through a computer-coded script known as a Markov Brain. This process will determine the optimal approach a company can make towards each of its consumers to ensure the purchase of a vehicle. The data will be re-coded and organized for viable results. Using C++, a code will be implemented on the data in order for the Markov Brain to correctly analyze each consumer. For this experiment, advertisement awareness, purchase intention, buyer opinion, gender and search effort will be the main variables analyzed. It is expected that there will be a pattern between each consumer’s response and whether or not he or she bought a car. It is predicted that both advertisement awareness and purchase intention will have the most significant effect on the purchase. It is believed that the more initiative the consumer takes when buying the car, the more likely he or she will purchase it. These findings will help better the company’s approach towards each consumer in order to increase the likelihood of a purchase. In doing so, these findings will help in understanding the relationship in consumer behavior and will increase the efficiency of saving a company both time and money as it consults with each customer. We expect this research to open more doors for any company wishing to increase their potential in their respective industries.

ANALYZING CONSUMER DECISION FUNNELS TO INCREASE SALES FOR GENERAL MOTORS USING MARKOV BRAINS

Tracey Jabbour
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 147
Mentor(s): Arend Hintze (Computer Science & Engineering), Randy Olson (Computer Science & Engineering)

Consumers were surveyed by General Motors on the processes they took before buying a specific car. The data that was collected from this survey is run through a computer script called a Markov brain, and from there will determine the optimal approach companies can make towards each consumer to ensure the definite purchase of a car. In doing so, these findings will save General Motors both time and money as they consult with each consumer. The data from the survey will be loaded into the computer

language C++ and organized to ensure correct results. The variables that will be analyzed are age, consideration, and familiarity, along with whether the car was test-driven. They will be tested against Cadillac, Chevy, Buick, and GMC cars. Using C++, a code will be implemented on the data set in order for the Markov brain to correctly analyze each consumer. It is expected that if an individual is older in age and has test-driven the car, along with an increase in familiarity and consideration of the car, then they are more likely to purchase it. These findings will help increase the company's techniques to allow the consumer to purchase the vehicle more easily. Understanding a consumer's approach to purchasing a vehicle will allow further growth in increasing the efficiency of time and money for a company. It is anticipated that this research will open more doors for not only General Motors, but for any company wishing to increase their potential in the industry.

ANALYZING AND IMPROVING AN AUTOMATIC OBJECT SEGMENTATION ALGORITHM FOR COMPUTER TOMOGRAPHY IMAGES

Antonios Doliotis
Home Institution: University of the Virgin Islands
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 148
Mentor(s): Dirk Colbry (iCER)

Computer tomography (CT) imaging uses x-rays to examine the internal properties of 3D objects, such as produce, rock minerals, and machine parts. Segmentation divides an image into two-dimensional (2D) image slices. Good image segmentation is necessary for efficiently analyzing, classifying, and assessing these virtual slices. The objective of this study is to analyze and improve an automatic image segmentation algorithm that segments objects scanned by a commercially available medical grade CT system. The segmentation algorithm was developed using a group of 160 chestnuts (Castanea spp.) which were divided into 753 2D image slices with a slice thickness of 1.25 mm. The algorithm will be analyzed by plugging in the chestnut data, and changes will be made to the algorithm to improve its accuracy. The algorithm is designed to separate unnecessary items such as the imaging table and air from the objects (chestnuts) being scanned. Overall grayscale intensity is used by the algorithm to determine the position of the object. Once the position is determined, the chestnuts can be segmented. The segmented images were post-processed by changing the segmented images to binary images using Otsu's method (threshold-based segmentation).

WINDOWING SYSTEMS TESTING

Antoine Douglas
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 149
Mentor(s): Dirk Colbry (Computer Science (iCER))

The goal of this research is to provide the foundation for developing a more responsive remote Graphical User Interface (GUI) for researchers using the High Performance Computing system at Michigan State University. Within the computational sciences, a desktop environment known as the X Windowing System (X11) is considered the standard system for the GUI. However, X11 was designed in the mid-80s to run on local, high speed, networks and is not effective when transmitting across long distances and slower networks. This project involves coming up with a set of performance based benchmarks to measure the efficiency of GUIs in order to develop a more optimal system design. A program was developed to measure program response time, which is the total time that a user spends waiting on commands to execute. After recording the data for X11, the same procedure is replicated to test the performance of other windowing systems including; X11 compressed and X11 through a Remote Desktop Protocol (RDP) connection. This statistical and visual data will provide the information needed to configure and develop a faster and more efficient system interface.

STUDYING THE EFFICIENCY INCREASE/DECREASE OF UNMANNED UNDERWATER VEHICLES USING A NEWLY PROPOSED METHOD TO CONNECT TO THE CLOUD

Patrick Munoz
Home Institution: Florida International University
Category & Time: Computer Science and Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 150
Mentor(s): Xiaobo Tan (Electrical And Computing Engineering)

Background: The use of unmanned underwater vehicles (UUV) to gather information from lakes and oceans has increased during the past few years. Currently a common method is used to collect this data by manually retrieving it and post-process it. We want to use a newly proposed method that suggests resurfacing and send the data to the cloud to use its computer power to process data in a more timely manner. Methods: We plan to use a UUV with a built in camera to gather footage from underwater environments. Then we plan to retrieve this data using the currently used method and the newly proposed method and compare their outcomes in terms of coverage, energy consumption, and efficiency of an algorithm. For coverage, we would give our UUV a predefined trajectory to follow in a water tank and see how much percentage of this trajectory was covered before running out of memory/storage. For energy consumption, we would drive our UUV in a water tank for t minutes and then compare the energy consumed by both methods taking into account that with the common method the UUV has to return to the user every time its been filled, while the in the proposed method it has to resurface to send the data to the cloud. Finally, we will use an object recognition algorithm and determine how many objects can be recognized after a certain amount of time. Results: We expect to see an efficiency increase using the newly proposed method.

UTILIZING TECHNOLOGY TO IMPROVE EFFICIENCY OF TEACHING AND LEARNING
Carl Johnson
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 152
Mentor(s): Gilbert Baladi (Civil and Environmental Engineering), Michael Prohaska (Civil and Environmental Engineering), Ron Rosenberg (College of Engineering)

The enrollment in some of the University courses has increased substantially over the last few years while available resources such as the number of TAs has decreased due to budget constraints. The consequence is that the number of contact or help hours on one-to-one basis has significantly decreased or been eliminated. Most help hours are being attended by large group of students who have variety of questions. Because of the lack of time, TAs answer the most common questions only. TA's duties typically include office hours, test, homework and quiz grading and attending help room. To address the problem, this research is directed using state-of-the-art technology to enhance the efficiency of both teaching and learning and to decrease the constraints on the instructors and TAs time. Specifically, a web application is being programmed and implemented in the CE221 Statics class to enhance student learning and decrease the demand on the instructor's and TA's time. Interactive homework sets that store student activities and steps while solving the homework problems are designed to assist the faculty and TAs to address the problems. The course relational database is being developed using MySQL, with the application written in PHP to generate immediate feedback on student answers, as well as outputting final grades to TAs. This reduces the time spent grading homework, and also gives the student plenty of material to view and use interactively. The full implementation of this research should improve student learning and reduce TA's workload in terms of grading homework.

HAND AND ARM TREMOR DETECTION USING KINECT SENSOR
Luan Tran
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 153
Mentor(s): Daniel Morris (Electrical and Computing Engineering)

Hand and arm tremors are common motion disorders caused by various neurological diseases. Early detection of tremors is important for treating the disease and may aid in discovering cures. The goal of this project is to use vision sensors to detect these tremors on a person when he/she is doing daily activities. Specifically we are going to use a Kinect, a widely used sensor for body tracking in games. By combining Kinect skeleton tracking function and computer vision tracking algorithms, we aim to develop a good arm motion approximation. Then, the tremor frequency can be estimated. The frequency result will be compared with rotation frequency of a disk in a ground truth device – a device that can convert rotation of a disk into linear motion of the arm or vice versa. The visually tracked motions will be compared with electromyography (EMG) measurements to explore for insights into limb tremors.

CONSTRUCTION OF WATER WAVES FROM CAMERA IMAGES
Qianyi Wu
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 154
Mentor(s): Daniel Morris (Electrical and Computing Engineering)

The purpose of this research is to identify a way to construct water surface that is taken by a conventional digital camera. Dr. Morris' Computer Vision Lab is attempting to develop tools to achieve this goal. Each pixel in an image measures the light along a ray entering the camera. Key to accurate construction of scene geometry is knowledge of the precise direction of these rays. We are using GoPro cameras which have wide-angle fisheye views, and usual calibration methods to determine ray directions do not work well because of large radial distortions. To solve this, I am developing a calibration tool specifically for fisheye lens cameras. This will undistort images so that they can be modeled as ideal pinhole camera and used by reconstruction algorithms. Another difficulty faced by water surface estimation is to obtain ground truth to test the algorithms. Hence my second goal is to use graphics tools, such as Blender to simulate the water surface and produce both realistic water images and ground truth depth maps from virtual camera views. The results of this research may have impact creating realistic virtual worlds as well as augmented reality.

3D LEAF SURFACE ESTIMATION
Vincent Zickefoose
Home Institution: Michigan State University
Category & Time: Computer Science and Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 155
Mentor(s): Daniel Morris (Electrical and Computer Engineering)

The Plant Biology Laboratory of Michigan State University currently has a system in place for the estimation of the total photosynthesis of plants. This system works adequately in cases where a plant has flat, fully visible leaves. The problem with this system is that, especially in the case of complex plants, leaf occlusion, or blockage from sight, prevents a complete collection of data. Such occlusion manifests in self in the form of leaves curling, and also growing over top of each other. In an effort to accurately estimate total photosynthesis, we must be able to determine both total surface area and the surface area of occluded regions of the

plant. We have determined that an application of 3D modelling using depth sensing technology, will assist us to this end. Information such as leaf height, angle, and surface area will be collected and then used to construct arbitrary 3D models of the plants. These models will describe all of the leaves of the plant, thus solving the problem of occlusion. Our goal is to, using Creative SENZ 3D depth sensing cameras, develop a system of collecting data that will include more information about the occluded regions of the plant. This system will be developed using Intel's Perceptual Computing SDK and OpenCV, both of which have a C++ programming interface. We will also be using Matlab.

DIFFERENTIATING ERRORS FROM RARE-EVENTS IN WIRELESS SENSOR NETWORKS

Rodny Perez
Home Institution: Borough of Manhattan Community College
Category & Time: Computer Science and Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 156
Mentor(s): Emily Dolson (BEACON)

The latest advances in technology have enabled the development of many sensors for data collection. By connecting multiple sensors into a network, we can make predictions about future events. Collecting more data will improve our predictions about future events. The problem is that, even though sensors can collect a vast amount of data, they are, as any other electronic device, prone to failure. Having erroneous readings or a dead sensor is a risk for data collection since this could lead to incorrect research results or loss of important data. This research aims to develop an algorithm for differentiating sensor errors or failures from rare events. We define a rare event as an unexpected sequence of data. Collection of additional data about a rare event is likely to be useful for future predictions, because, by definition rare events are not well understood. We want our algorithm to be able to decide if the collected data comes from an error or a rare event. To test our algorithm, we generate simulated data and insert simulated errors with characteristics described in the literature: sudden change in slope, spatial consistency, internal consistency and drift towards a particular value. To determine whether a given anomaly is an error or a rare event, we will look at the consistency of correlations among sensors; a rare event would likely result in anomalous readings among all correlated sensors rather than a single one. We expect that our algorithm will successfully distinguish errors from rare events, using this principle.

ELECTRICAL & COMPUTER ENGINEERING

WIRELESS CHARGING OF ROBOTIC FISH THROUGH INDUCTIVE COUPLING

Pachaimuthu Suriya Madhan
Home Institution: PSG College of Technology, India
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 158
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

The purpose of the research is to design a wireless charging system for a robotic fish in water. The motivation is that the conventional way of wired charging requires taking the robot out of water and thus incurs human labor cost. The proposed approach for wirelessly recharging the battery using "Induction Coupling", which involves two coils, one being the transmitter coil and the other being the receiver coil. When there is DC power supply to the oscillator, it in turn creates oscillations that are supplied to the transmitter coil. The transmitter coil in turn induces an electromotive force (emf) in the receiver coil due to the change in the magnetic field. The receiver rectifies and regulates the output to the required voltage. The challenge is that the coupling efficiency drops quickly with the gap between the transmitter and the receiver coils and with the misalignment of the coils. Research is conducted to investigate solutions for obtaining adequate transferred power despite the aforementioned challenges.

NEW PHASED ARRAY MODELS FOR FAST NEARFIELD PRESSURE SIMULATIONS

Kenneth Stewart
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 159
Mentor(s): Robert McGough (Electrical and Computer Engineering)

FOCUS, the 'Fast Object-oriented C++ Ultrasound Simulator,' is free MATLAB-based software that rapidly and accurately models therapeutic and diagnostic ultrasound with the fast nearfield method, time-space decomposition, and the angular-spectrum approach. FOCUS presently supports arrays of circular, rectangular, and spherically focused transducers arranged in flat planar, spherically focused, and cylindrically focused geometries. Excellent results are obtained with all of these array geometries in FOCUS for simulations of continuous-wave and transient excitations; however, new array geometries are needed for B-mode simulations that are presently under development. These new array geometries also require new data structures that describe the electrical connectivity of the arrays. Efforts to develop these new features in FOCUS will be demonstrated , and results obtained with these new array geometries will be presented. Other efforts to develop new features for FOCUS will also be described.

RECONSTRUCTING AND CLASSIFYING DAMAGE IN A 2D STEEL PLATE USING NONDESTRUCTIVE EVALUATION (NDE) METHODS

Nicholas Kemp, Jazten Bass
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 160
Mentor(s): Victor Karthik (Electrical Engineering), Samuel Ratnajeevan H Hoole (Electrical and Computer Engineering), Sivamayam Sivasuthan (Electrical Engineering)

Ground army vehicles like trucks and tanks are made out of steel plates to protect their passengers. When these vehicles take an impact from a bomb or other explosive they are immediately taken out for service without justifying if the vehicle is due for withdrawal or not. In our research we are studying defect characterization and coming up with a new methodology so that the withdrawal of the vehicle may be thought out carefully, and not a waste money, and ensure safety of its passengers. Defect characterization is of a thin crack within a material with a specific size and shape. To make sure this new methodology is effective we are using an eddy current probe. The eddy current probe consists of an electrical coil that when energized, will produce magnetic fields. When the magnetic field runs through a defect-free steel plate there will be no change of field and that will indicate that there is no defect in the material; but if the magnetic field has even the slightest change then a defect is detected. These changes are used by others in the group to evaluate the shape and other characteristics of the defect.

NETWORK SECURITY & SPEED TRADE-OFFS

Aaron Banks
Home Institution: Shaw University
Category & Time: Electrical and Computer Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 161
Mentor(s): Jory Schossau (Computer Science & Engineering)

Background: In today's world with different methods of counter-security and surveillance implemented by entities such the National Security Agency and other similar organizations. We seek to find if how our proposed network security system will hold up in our certain network configurations and network loads. Purpose/Hypothesis: We will be exploring the trade-off(s) between efficiency and security of distributed alternate packet routing paths through large networks. Our research question is: Is there an efficient trade-off between security and speed in a computer network? We hypothesize there will be some sort of efficient trade-off of network load and security, we predict there are some configurations in which the entire system deadlocks.
Procedures/Data/Observations: We are using the C++ programming language in order to build a model network and explore different workloads under the algorithm. Conclusions/Applications: We will be able to explore if the proposed method would be a viable option to mitigate centralized undesired surveillance subsequently improving security.

OPTICAL CHARACTERIZATION OF MICROLENSES ALONG THIN POLYMER FILMS

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

Thin polymer films are used in everyday applications such as protective coatings, lubricants, sensors, bio-membranes, and adhesives. Dewetting is the process of fabricating small devices that are usable for reduce energy consumption. Therefore, polymer films spread onto thin surfaces as they do on non-wettable surfaces. These non-wettable surfaces can be any surface from the electronic field or the solvent vapor atmosphere. Dewetting is an undesirable process because it causes problems with component parts, solder joints, or pads. Optical characterization is the practice of using an optical microscope to view the microlenses along the polymer films.

ADAPTIVE FILTER DESIGN FOR NOISE CANCELLATION IN NDE USING EC-GMR SENSOR

Anuj Nayak
Home Institution: People's Education Society Institute of Technology, India
Category & Time: Electrical and Computer Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 164
Mentor(s): Yue Huang (Electrical and Computer Engineering), Lalita Udpa (Electrical and Computer Engineering), Chaofeng Ye (Electrical and Computer Engineering)

In the field of Non-Destructive Evaluation (NDE), the use of Eddy Current and Giant Magnetoresistive (EC-GMR) sensors is promising for the detection of anomalies at varying depths in sub surfaces of multi-layered structures. Since the characteristics of the signals are exploited for detection and analysis of defects, accurate, high precision measurement of signals is important to achieve. But, signals from the GMR sensor are in general corrupted by various types of noises and interferences, one of the main sources being power-line interference. The characteristics of noises and interferences are non-stationary. To address this issue, there is a need to design an adaptive filter which extracts the desired signal and adapts to the variation in noise characteristics with time. Here, the objective is to attain high output signal to interference-plus-noise ratio (SINR) and low adaptation time. The filter design is analysed and optimized for different design parameters, which is used to achieve the optimization in real-time using an adaptive filter. Consequently, the reliability of the acquired signal can be increased, thereby increasing the acquisition speed and accuracy of the

extracted GMR signal. Further, such schemes can reduce the number of signal cycles required for signal extraction. Trade-off among the parameters like distortion, error performance and hardware requirement is also evaluated in the filter design.

OPENROV ROBOT DESIGN AND EXPLORING
Yujie Hao
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 165
Mentor(s): Xiaobo Tan (Electrical and Computer Engineering)

OpenROV robot is an underwater robot which is used to record videos and receive information by additional sensors. The external body of the OpenROV robot is made out of acrylic, which is a plastic material. It is held together by a water-thin solvent which is used to glue the acrylic parts together to form the external shell. The robot's interior is made waterproof by use of o-rings in the joints holding the batteries and micro-controller box. The batteries are separated into two cylinders, and the micro controller in a third cylinder. The designed Graphical User Interface (GUI) for the OpenROV displays several pieces of information. For instance, battery usage, supply current, local time, and live video feed. The user can control the robot through the arrow keys on their keyboard. Because OpenROV robot works under the water. The leaking problem will be a big issue. Every time we test the robot in the water, there always have tiny water coming into the robot. Now my partner and I are working on avoid water touching the circuit board. One limitation of OpenROV robot is that it only works when directly connected with users' computer. In the future we plan to customize the robot, adding features, such a temperature sensing and wireless control.

MICRO-CONTROLLING TECHNOLOGY
Jeffery Ware
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 166
Mentor(s): Kyle Foster (Engineering)

For my research projects I have been learning about arduino micro controllers. Arduino is a open source platform for micro controllers that allow you to do anything with them. Micro controllers are used daily with all of the task that we do such as opening garage doors or opening anything remotely. I also learned how to build circuits using a breadboard as well. My projects generally start out by building the circuit for the project first then I use a battery or any power source to plug it into the arduino uno and after I program it things will happen such as making motors move and turning on lights.Now I am exploring different ways that I can use my arduino uno for a project that I am creating.

A SURFACE BLENDING SCHEME FOR THE GENERALIZED METHOD OF MOMENTS
Zane Crawford
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 167
Mentor(s): Shanker Balasubramaniam (Electrical and Computer Engineering), Daniel Dault (Electrical and Computer Engineering)

Accurate computation of fields scattered is challenging due to (i) approximation inherent in the description of the object, and (ii) approximations due to functions that are defined on this geometric representation. We present a scheme to compute scattered electric fields from arbitrarily shaped two dimensional objects. The method develop is capable of recreating geometries to very low error, as well as define globally continuous normals using a partition of unity. Furthermore, we will demonstrate the application of this methodology in computing scattering within the framework of the Generalized Method of Moments.

ASSISTANCE IN COMMUNICATION AND MEMORY USING SEMANTIC SPEECH ANALYSIS
Ryan Gallant
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 2, 2:00 PM - 3:00 PM
Poster: 168
Mentor(s): Subir Biswas (Electrical and Computer Engineering), Bo Dong (Electrical and Computer Engineering), Yan Shi (Electrical and Computer Engineering)

Even in today's world of texting and instant messaging, speech is the most common method of communication among people. In order to facilitate spoken conversation by memory impaired individuals, a smart phone application for providing conversational context via speech analysis is being developed. Utilizing speech to text capability, voice recognition, location, timing, and other related services, this application seeks to provide the user with context for their current conversation. The application does so by identifying the speaker and utilizing a database paired with a semantic search module to find information on previous conversations the user had with the current speaker. The current study examines the utility of conversational context extraction and storage for assisting those with speech and memory problems to converse normally with friends and relatives. The system consists of an Android application which acts as the user interface and interacts with various speech/speaker recognition engines and semantic graph search modules for constructing conversational context. It also contains software modules that can follow a conversation and provide contextual feedback to speakers for assisting with memory problems.

PERSONAL HEALTHCARE MONITORING USING SINGLE-SENSOR EMG SIGNALS FROM THE HUMAN BODY
Jaylin Jones, Janae Dawkins, Eric Ofori-Peprah
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 170
Mentor(s): Dean M. Aslam (Electrical and Computer Engineering)

The objective of researching EMG circuitry is to find a way to detect diseases, affecting muscles and nerves, quicker and more easily. Our research consists of developing an inexpensive single-sensor EMG. As the ultimate goal of our research is to detect early signs of neural disorders, the research focuses on data collection using EMG and image processing of the video of part of the body that contains the muscle being observed. For example, we compare EMG data with vibrations detected by the image processing of the video to detect early signs of Parkinson's disease. The data taken will be imported into MATLAB where it will be pulled through filter software that is created from scratch and then amplified again. A typical EMG circuit has three important parts; the instrumentation amplifier, filter circuit, and amplification. We have completed the instrumentation amplifier circuit using INA 333 and done some initial testing. After building a complete EMG circuit, we will analyze EMG signals and compare with the image processing data obtained by Professor Morris's student. For personal healthcare monitoring, the EMG system will be miniaturized so that it becomes wearable.

EVALUATION OF THE QUALITY OF WAVELET COMPRESSED NEURAL SIGNALS BASED ON SPIKE SORTING PERFORMANCE
Sylmarie Davila-Montero
Home Institution: University of Puerto Rico at Mayagüez
Category & Time: Electrical and Computer Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 171
Mentor(s): Andrew Mason (Electrical and Computer Engineering), Yuning Yang (Electrical and Computer Engineering)

Brain Machine Interface (BMI) is a powerful tool for individuals with neural disorders. The wireless implantable neural recording system is part of the platform of a BMI that classifies neural spikes by their shapes to help these individuals to achieve a better quality of life. The classification of neural spikes is achieved by compressing neural signals and transmitting them to an external processing unit that reconstructs signals and identifies different spikes to different neurons. The compression of the signal is required due to the limitation of low bandwidth. The compression and reconstruction of the signal is implemented using the discrete wavelet transform and the inverse discrete wavelet transform, respectively. In this research, we present the analysis of specific parameters such as: decomposition levels, wavelet bases and threshold methods, to accomplish a better signal compression while maintaining good spike sorting accuracy. To make this possible, a data compression algorithm for different values of decomposition levels was implemented using MATLAB as our development environment. The quality of the reconstructed signal was measured by the compression ratio (CR) and the spike sorting performance. It has been observed that by increasing the decomposition levels it is possible to obtain a lower CR at the cost of little decrease of spike sorting accuracy compared to signals without compression. The results suggest that the hard, level 4 and Sym3 from the threshold methods, decomposition levels and wavelet bases, respectively, are the optimum set of parameters to accomplish a better signal compression based on spike sorting performance.

EMBEDDED WIRELESS VISIONS SYSTEM FOR MINIATURE ROBOTS
Hongyi Shen
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 172
Mentor(s): Ning Xi (Electrical and Computer Engineering), Jianguo Zhao (Electrical and Computer Engineering)

In this project, we aim to implement an embedded wireless vision system for miniature robots. Equipped with such a system, miniature robots with size of a few centimeters can send video wirelessly back to a computer. The system has two printed circuit boards, one connected to the computer and the other one attached to the robot. Each of the boards has a micro-controller with Zigbee communication capability. The board on the robot can read image data from a miniature camera and send the image to the board connected to the computer. The computer, once received the image, can display the image on the computer screen. Miniature robots with such a system have a wide range of applications such as search and rescue, environmental monitoring, and biological motion analysis.

DESIGN STUDY OF 3-D PRINTED LEAKY WAVE ANTENNAS
Eleazar Gutierrez
Home Institution: Michigan State University
Category & Time: Electrical and Computer Engineering, Section 3, 3:00 PM - 4:00 PM
Poster: 173
Mentor(s): Prem Chahal (Electrical and Computer Engineering)

There is a growing need for antennas in many applications ranging from wireless communications to sensors. In parallel, the use of 3-D printing is something that has been gaining popularity in recent years. This popularity stems from the ability to make very complicated structures at low-cost and short turnaround time of prototyping. 3-D printing has been utilized in the fabrication of complicated physical structures and minimum work has been demonstrated in its use in the fabrication of antenna structures. Under this research work, 3-D printing is adopted in the fabrication of antenna structures. Among the many potential antenna designs, this work, in particular, focuses on leaky wave antennas. Leaky wave antennas belong to the traveling wave antenna class which uses a

guiding structure as the main form of radiation. They are attractive due to their relatively simple geometry and simple fabrication. These antennas have high potential for use in anti-collision for automobiles, thin film radio frequency identification (RFID), communications, and military applications. Under this research work a half-width microtrip leaky wave antenna is demonstrated using 3-D printing. This work will present the details of antenna design, fabrication and measurements.

EPIDEMIOLOGY & PUBLIC HEALTH

RISKS OF PRESCRIPTION DRUG USE AND INCREASED MEDICALIZATION IN CHILDREN AND ADOLESCENTS

Morgan Burnette
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 1, 2:00 PM - 3:00 PM
Poster: 175
Mentor(s): Dilshani Sarathchandra (Lyman Briggs College)

The amount of medications being prescribed to adults and children has increased dramatically over the last several years. Major causes of this trend are the drug companies' push for new medications and the social amplification of risks of illness. The ethics behind prescription medication in children and adolescents are being tested anew. Many issues arise in these populations because the drugs are not always tested on individuals under the age of eighteen and the parent or legal guardian has authority in the medical treatment plan. Prescription drugs can pose many adverse side effects in children and adolescents. However, doctors continue to prescribe medication as opposed to suggesting other forms of treatment such as lifestyle changes, therapy, or natural remedies. Even though doctors know the side effects of these drugs, why do they continue to prescribe them? In this research I present a case study of the ethical dimensions of prescription drug use and increased medicalization in children and adolescence in the U.S. Using ICPSR 2012 National Survey on Drug Use and Health dataset, I identify prescription drug use patterns among children and adolescence and its prevalence in society. The findings shed light on aspects of increased medicalization of society.

IDENTIFICATION OF PREVENTATIVE STRATEGIES FOR OCCUPATIONAL INJURIES IN TEENS

Veronica Tijerina
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 1, 2:00 PM - 3:00 PM
Poster: 176
Mentor(s): Elahé Crockett (Medicine), Kenneth Rosenman (Medicine)

Introduction: Occupational injuries in teens have been an issue of concern in Michigan and throughout the United States. Teens have a higher risk of getting occupational injuries than adults because of their inexperience at work. Objectives: The focus of this study is to review occupational injuries in Michigan's teens, ages 14-17, from 2006 to 2012; to identify the population at risk, describe types of injuries, and identify preventive strategies. Methods: The investigators used data collected by Michigan's occupational injury and illness surveillance system, which is administered by Michigan State University, on burns, amputations, skull fractures, elevated blood lead levels, and fatalities to describe work-related injuries and deaths of teens in Michigan. The years of data used varied for each condition; 2006-2012 for amputations and elevated blood lead levels, 2009-2012 for burns, 2010-2012 for skull fractures, and 2001-2012 for fatalities. The number of employed 14-15 year olds is not collected in employment statistics; therefore the data reported only reflects the rates for 16-17 year olds. Results: There were 114 burns for ages 15-17, 29 amputations for ages 16-17, 115 elevated blood lead levels for ages 14-17, and 13 fatalities for ages 14-17. The data is under further review/analysis and will be discussed during presentation. Support: V.T. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

EXAMINING THE DISPARITIES IN LUNG CANCER MORTALITY ACROSS SOCIAL CATEGORIES IN THE U.S. FROM 1968–2010

Ashley Butler
Home Institution: Fisk University
Category & Time: Epidemiology and Public Health, Section 1, 2:00 PM - 3:00 PM
Poster: 177
Mentor(s): Wenjiang Fu (Biostatistics and Epidemiology)

Introduction: Lung cancer mortality remains a problem in the U.S. for men and women, by it being the leading cause of cancer death in the U.S. According to multiple sources, cigarette smoking is the number one risk factor for lung cancer and increases incidence by approximately 90% in men, and about 80% in women. Methods and Materials: This main focus of this study is to examine a trend in education and income status, for men and women in lung cancer mortality from 1968–2010. Direct standardization will be used for age and region, to eliminate bias in population distribution. The reference population will be the U.S. Census 2010 population and all data will be collected using the Center for Disease Control and Prevention's Wide-Ranging Online Data for Epidemiologic Research (CDC WONDER) database. Then a linear regression model will be used to show differences in lung cancer for both women and men. Results: We anticipate that our research will show that women have a higher mortality rate, by previous research and in income and education status. We will be taking the U.S. population, and compare it to the four U.S. Census regions: Northeast, South, West, and Midwest. Discussion: This study will provide supplemental or confounding evidence in showing disparities for men and women in lung cancer mortality by income and education status. Conclusion: Lung cancer mortality is still a problem and requires the need for further interventions to cater to the needs of those in each subgroup or social category.

MENTAL HEALTH TRENDS IN US COMMUNITIES AFFECTED BY NATURAL DISASTERS
Olivia Leaven
Home Institution: Bennett College
Category & Time: Epidemiology and Public Health, Section 1, 2:00 PM - 3:00 PM
Poster: 178
Mentor(s): James Anthony (Epidemiology and Biostatistics)

Background: I intend to focus my research career on community-level responses in the aftermath of unexpected mass disasters as defined by CRED (Centre for Research on the Epidemiology of Disasters.) Disasters may occur at random, but human responses to disastrous events do not occur randomly. Public health interventions after mass disasters can be structured in relation to the patterns of human disaster responses, with due attention to variations across subgroups defined by sex, age, geographic location, and type of disaster. Materials and Methods: Estimates are based on data from annual nationally representative sample surveys of United States non-institutionalized community residents age 18 years and older, with an approximate population of 60,000 survey respondents each year and a survey participation level generally above 70%. My research's statistical methods involve the use of estimated proportions and odds ratios, with meta-analytic forest plots to summarize the available study evidence. Discussion: This finding raises three interesting new questions: (1) Is it possible that men and women respond differently to disaster events, at least as far as serious psychological distress goes? (2) Is it possible that females are more likely to experience SPD in the aftermath of a disaster-event, as compared to men? And (3) Is it possible that men and women in different geographic locations mentally respond differently to disasters based on regionally interesting variations (e.g., social and anthropologically interesting variations within the US).

NUTRITIONAL KNOWLEDGE COMPARISON OF MICHIGAN MIGRANT HEAD START STAFF VS MICHIGAN MIGRANT SEASONAL FARMWORKER PARENT
Saral Garcia
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 1, 2:00 PM - 3:00 PM
Poster: 179
Mentor(s): Won Song (Food Science and Human Nutrition)

Background: Michigan employs the 5th largest farmworker population in the United States. The Telamon Corporation funds Michigan Migrant Head Start (MMHS) centers, which offer early childhood education services and connects migrant farmworker families with resources in their communities. A total of 1209 children were served in 18 MMHS centers in 2012-2013. The Department of Food Science and Human Nutrition at Michigan State University, in collaboration with Telamon, evaluated the characteristics and nutritional needs of Migrant Seasonal Farm Workers (MSFW) children and MMHS staff. The aim of this study is to compare the nutritional knowledge of Migrant Head Start staff with that of MSFW parents and how this factor may influence dietary behaviors. Methods: Parents with at least one child in MMHS (aged 0-5 years, n=76) and staff members (teachers, assistant teachers, etc., n=309) were recruited from 5 Telamon MMHS centers in Michigan to complete an online nutritional needs assessment survey and automated self-administered 24-hour Recall (ASA24) Results: The data is currently under review/ analysis using Statistical Analysis Software 9.3 (SAS) and will be discussed during presentation. Support: S.G. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

IMPROVING KNOWLEDGE OF CORONARY ARTERY DISEASE AND IMPLEMENTING SHARED DECISION MAKING SKILLS FOR PATIENTS WITH DIABETES AND CORONARY ARTERY DISEASE
Ashley Lyles
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 2, 3:00 PM - 4:00 PM
Poster: 181
Mentor(s): Elahé Crockett (Medicine), Bikki Gautam (Medicine), Adesuwa Olomu (Medicine)

Background: Coronary artery disease (CAD) is the most common form of heart disease and the leading cause of death in the U.S. Lifestyle choices and knowledge of patient medical conditions are key factors in determining a patient's health. Patient engagement and shared decision making (SDM) skills are linked with improved health outcomes. Objective: To assess a patient's health knowledge and engagement in their care regarding CAD before and after participation in Office-Guidelines Applied to Practice (Office-GAP) program group visit. Methods: The Office-GAP study was designed to enhance the cardiovascular care of minorities and low income populations who attend Federally Qualified Health Centers (FQHCs). Office-GAP provides patient and physician training decision support interventions. Patients participate in a group visit to improve their knowledge about diabetes and heart disease care. We analyzed 160 patients that participated in group visits from 2010-2014. Results: Patients who understood their condition increased from 27% to 83% after the group visit. Patients' understanding of prevention and treatment of CAD increased from 31% to 89%. An increase from 44% to 90% in patients' comfort in discussing their CAD with their physician and an increase from 48% to 92% in patients that felt comfortable making treatment decisions with their doctors. Participation in Office-GAP group visit led to significant increase in patients' understanding of CAD. Conclusions: Improved patient participation in SDM might be a viable tool to enhance patient knowledge and ultimately improve cardiovascular outcomes. Support: A.L. is a NHLBI scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

VARIOUS PATTERNS IN READINESS OF USE OF TECHNOLOGY IN FEDERALLY QUALIFIED HEALTH CENTERS
Melanie Jamel
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 2, 3:00 PM - 4:00 PM
Poster: 182
Mentor(s): Gurpreet Chahal (Medicine), Elahé Crockett (Medicine), Adesuwa Olomu (Medicine)

Background: Internet access is related to improved awareness about diseases and healthier lifestyles. A Health study revealed many Americans access health-related information online before visiting a physician. Patients who text, call, and/or email their doctor were more compliant with treatment plans. Objectives: Determine accessibility of medical resources via Smartphone, rates of use in relation to patients with diabetes mellitus (DM), and quantifying readiness to access medical resources between demographics. Method: Data derived from Office-Guidelines Applied in Practice (Office-GAP) Program, designed to improve prevention and treatment of cardiovascular disease (CVD) for minority and low-income populations with DM/CVD in Michigan Federally Qualified Health Centers (FQHCs). Technology readiness and access survey of 134 patients that participated in group visits were evaluated. Chart abstractions were performed for data. Results: Overall, 82.1% [110 of 134] of patients were diabetic, 61.8% [68 of 110] with cell phones, 58.2% [64 of 110] were unable to send/receive texts and 59.1% [65 of 110] had no access to Internet/email, 70.9% [78 of 110] didn't want to text and 73.6% [81 of 110] didn't want to email their physician. Although, over half of our diabetic patients had cellphones, less than one-third of patients wanted text/email communication with their physician and almost half of them didn't have Internet access. Internet access was also inversely related to age and number of comorbidities. Results influenced by limitations, like low economic class and lack of resources. Support: M.J. is an NHLBI scholar, support by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

PREVALENCE AND POPULATION DYNAMICS OF RACCOON ROUNDWORM IN WEST MICHIGAN: ASSESSING THE POTENTIAL OF AN EMERGING ZOONOSIS

Christina Sarkissian, Sara Campbell
Home Institution: Grand Valley State University
Category & Time: Epidemiology and Public Health, Section 2, 3:00 PM - 4:00 PM
Poster: 183
Mentor(s): Douglas Graham (Biomedical Science)

Baylisascaris procyonis, a.k.a. raccoon roundworm, is increasingly being recognized as a cause of zoonotic visceral, ocular, and neural infections, and in particular, of severe encephalitis in young children. The aims of this project are to assess the prevalence of this parasite in West Michigan, describe its population genetics, and gauge the degree to which it represents an emerging zoonotic threat to humans via spillover infections in dogs. Despite its emerging public health importance, very little is known about the population dynamics of this parasite. DNA for the genetic analyses was obtained from adult worms harvested from euthanized raccoons provided by fur-trappers, animal control operations, roadkills. and from deworming procedures carried out on dogs at the Human Society of West Michigan. Over 200 specimens of *B. procyonis* were collected from 84 raccoons over a 12 month period. Prevalence of infection showed a pronounced seasonal variation: close to zero during the winter and over 70% during the late summer and fall. Preliminary results from population genetic analysis indicate extensive gene flow and weak population structure, as would be expected given the restricted geographic scale of this project and the vagility and cosmopolitan nature of raccoons. None of the dewormed dogs tested positive for *B. procyonis*.

HOW ACCURATELY DO CONSUMERS ESTIMATE THE NUTRIENT CONTENTS OF MEALS?

Cedrena Davis
Home Institution: Michigan State University
Category & Time: Epidemiology and Public Health, Section 2, 3:00 PM - 4:00 PM
Poster: 184
Mentor(s): JaeMin Cha (The School of Hospitality Business)

Recent legislation has required calorie labels on restaurant menus as a means of improving health and reducing obesity among general consumers. Provision of nutrition information to consumers could potentially have an important impact on improving public health. This research documents effects of health claims and nutrition information on consumers' healthy menu choice. Using a survey methodology, we investigate the relationship between nutritional knowledge and healthy food choice. We also examine how accurately consumers estimate the nutrient contents of meals (e.g., calories, fat, and sodium). Based on the literature review and study findings, innovative strategies to present nutrition information effectively are addressed in this study.

REGIONAL VARIATION IN DRUG PURCHASE OPPORTUNITY AMONG PERSONS AGED 12-29 IN THE UNITED STATES, 2002-2011

Marven Cantave
Home Institution: Case Western Reserve University
Category & Time: Epidemiology and Public Health, Section 2, 3:00 PM - 4:00 PM
Poster: 185
Mentor(s): James Anthony (Epidemiology and Biostatistics)

The aim of this study is to examine the geographic variation in illegal drug purchasing opportunity among individuals living within the United States; there was a subfocus on age, sex, and urban/rural residence. A nationally representative sample of 243,444 noninstitutionalized community residents aged 12-29 years old were analyzed with data from the 2002-2011 National Survey on Drug Use and Health (NSDUH). Respondents were asked if someone had approached them to sell to them an illegal drug during the past 30 days. To respect the respondents' confidentiality, information regarding his or her exact geographic location was withheld from the NSDUH public use data files, but nine geographic indicators were provided (i.e. Middle Atlantic, Pacific, etc.). Results indicated that there were statistically significant differences between males and females within regions regarding the frequency he or she was approached with the opportunity to purchase illegal drugs. Also, with regard to regional differences, men and women of the Middle Atlantic were more likely to be approached with illegal drug purchasing opportunities (23.5% and 12.0 % respectively) then individuals from any other US region. Hopes for this study were also to control for individuals who not only were approached with illicit drug offers, but whom themselves also sold illegal drugs within the past 12 months. This study is an update to a similar study published in the Journal of Urban Health (Vol. 79, No.1, March 2002) by authors James, Wagner, and Anthony.

INTEGRATIVE BIOLOGY

HYENA AND LION INTERACTIONS

Sarah MacLachlan
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 187
Mentor(s): Kay Holekamp (Natural Science), Kenna Lehmann (Natural Science), Tracy Montgomery (Natural Science)

The spotted hyena (*Crocuta crocuta)* is an integral carnivore in the African ecosystem and competes directly with lions for access to food. This preliminary examination will look at the interactions between lions and hyenas in the Maasai Mara National Reserve in Kenya. During these interactions hyenas frequently "mob" lions, in which two or more hyenas act together to approach and aggress on one or more lions in an attempt to gain control of a carcass. Our expected results are based on current knowledge of lion and hyena behavior and will be tested in our analysis of 25 years of archived field notes. First we hypothesize that more hyenas will participate in a mob when a male lion is present because a male lion is much larger and more dangerous than a female lion. Second, we hypothesize that the rank of the hyenas present will affect who participates in mobbing behavior because lower ranking hyenas do not have priority access to food. Third, we hypothesize that hyenas are more likely to join a mob that contains their relatives, because access to food will then increase the fitness of both the individual and its relative. The results of this study can be used to better understand lion and hyena behavior and the ecosystem dynamics of the Maasai Mara, thus improving the conservation of both of these characteristic carnivores in their natural habitats.

IDENTIFYING NEUROTENSIN NEURONS IN THE BRAIN THAT REGULATE THE VENTRAL TEGMENTAL AREA

Faith Thornton
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 188
Mentor(s): Gina Leinninger (Physiology)

Introduction: The neuropeptide neurotensin (Nts) inhibits feeding and promotes drinking behavior via activating dopamine neurons in the ventral tegmental area (VTA). Nts neurons are distributed throughout the brain and it remains unclear which Nts neurons regulate behavior via projections to the VTA. We therefore examined whether Nts-neurons in the Lateral hypothalamic Area (LHA), Arcuate Nucleus (Arc), Nucleus Accumbens (NAc) and Preoptic Area (POA) can project to the VTA. Methods/Results: Mice that express green fluorescent protein (GFP) in Nts neurons were used to identify Nts neurons (referred to as Nts^{GFP}-mice). Nts^{GFP}-mice were treated with leptin (a hormone that inhibits feeding) or subjected to dehydration (promotes desire to drink) to determine if these stimuli regulate Nts-neurons in the LHA, ARC, NAc and POA to modulate feeding and drinking behaviors. Additionally, mice were injected with a retrograde tract tracer into the VTA, which accumulates in cell bodies of any neurons projecting to VTA. Using these reagents, we identified many Nts-neurons in the LHA, NAc and POA, and a smaller proportion of Nts-neurons in the ARC. Interestingly, leptin and dehydration primarily regulate Nts-neurons in the LHA. Further, we're characterizing which regional populations of Nts-neurons project to the VTA. Collectively, our findings will determine the precise Nts-neurons that regulate feeding and drinking, particularly, which of these exert their actions via projections to the VTA. Conclusion: Mapping Nts-neurons has potential to develop modalities to regulate body weight/obesity. Support: F.T. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

A NOVEL MOUSE MODEL TO STUDY NEUROTENSIN RECEPTOR-2

Lindsey McQuade
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 189
Mentor(s): Gina Leinninger (Physiology), Hillary Woodworth (Physiology)

Neurotensin (Nts) is a neuropeptide produced in the brain and intestine that is implicated in regulating feeding, locomotor activity, learning and nociception. Neurotensin regulates cells expressing Neurotensin receptor-1 (NtsR1) or -2 (NtsR2), but the lack of comprehensive methods to identify and manipulate Nts-responsive cells in the body has limited our understanding of Nts action. Seeking to study the specific role of Nts signaling via NtsR2, our lab generated a knock-in mouse model in which Cre recombinase is expressed selectively within NtsR2 neurons (NtsR2Cre mice). To identify NtsR2 cells, we bred NtsR2Cre mice onto a cre-inducible green fluorescent protein (GFP) background, so that GFP is expressed selectively in NtsR2 cells and can be identified via immunofluorescent microscopy. As a first step we used these mice to analyze which locations of the brain express NtsR2. We observe a large population of NtsR2 neurons within the hippocampus, a region important in the regulation of learning and memory. Additionally, we observe NtsR2 neurons within the ventrolateral periaqueductal grey (VLPAG) and the ventral tegmental area (VTA), regions important for nociception and motivated behaviors, respectively. NtsR2 is also expressed within astrocytes throughout the brain, glial cells implicated in the regulation of cerebral blood flow and the support of surrounding neurons. Thus, NtsR2Cre mice permit the identification of NtsR2 cells in the brain. Going forward, we will use this model to selectively interrogate the role of Nts action via NtsR2 in these brain populations.

DEVELOPMENT OF A NEW MOUSE MODEL TO INVESTIGATE OREXIN NEURONS IN ENERGY BALANCE
Jaylyn Kelly, Leonie-Alexa Koch
Home Institution: Michigan State University, Heinrich-Heine-University Düsseldorf
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 190
Mentor(s): Raluca Bugescu (Physiology), Gina Leinninger (Physiology)

The lateral hypothalamic area (LHA) of the brain regulates eating, sleeping and movement via molecularly distinct populations of neurons including those that express either melanin-concentrating hormone (MCH) of Orexin/hypocretin. Previous studies have shown that Orexin neurons are essential regulators of feeding behavior, sleep/wakefulness cycle, and the coordination of the reward system and energy homeostasis. Further study of Orexin neurons, however, has been limited by the lack of Orexin-specific molecular tools to identify and manipulate these neurons. Currently the only commercially available mouse model to identify Orexin neurons does not permit selective manipulation of these neurons and only identifies 45% of Orexin neurons, making it impossible to study the full extent of Orexin actions. We therefore developed a knock-in mouse model in which cre recombinase is exclusively expressed in Orexin neurons, and thus permits their selective manipulation via Cre/Lox technology: we refer to these as OrexinCre mice. To verify the specificity of OrexinCre mice, we crossed them with a cre-inducible green fluorescent protein (GFP) reporter mouse to induce GFP expression only in cre-containing Orexin neurons. As expected, GFP-expressing Orexin neurons are distinct from MCH neurons in the LHA. Via dual immunofluorescent microscopy for GFP and endogenous Orexin, we show that OrexinCre mice correctly identify 99% of all Orexin neurons. Thus, the newly developed OrexinCre line specifically and accurately identifies Orexin neurons, and will be a useful tool for determining how Orexin neurons regulate energy balance.

DOES LOSS OF ACTION VIA NEUROTENSIN-LEPTIN RECEPTOR NEURONS PROMOTE OBESITY BY DISRUPTING DOPAMINE SIGNALING?
Saba Jaleel
Home Institution: Hunter College
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 191
Mentor(s): Gina Leinninger (Physiology)

The lateral hypothalamic area (LHA) acts in concert with the dopamine system to modulate motivated feeding and locomotor behavior. We seek to understand the specific role of LHA neurons that co-express the neuropeptide Neurotensin (Nts) and the leptin receptor (LepRb) in regulating dopamine signaling and behavior; we refer to these as Nts-LepRb neurons. We have previously shown that Nts-LepRb neurons are essential mediators of leptin action, project into the mesolimbic dopamine system, and that loss of action via these neurons causes inactivity, overeating and obesity. We therefore hypothesize that loss of action via Nts-LepRb neurons disrupts the regulation of the mesolimbic dopamine system to derange behavior and weight. To examine this, we generated mice with intact action via Nts-LepRb neurons (Controls) and mice that lack LepRb in these neurons (LRKO mice.) We analyzed the ventral and dorsal striatum (key brain areas that regulate dopamine-mediated behavior) from Control and LRKO mice via western blotting. In particular, we examined proteins that regulate dopamine signaling and behavior, including dopamine receptor 2 (D2R), tyrosine hydroxylase (TH), dopamine transporter (DAT), cAMP response element-binding protein (pCREB), D1R (Dopamine receptor D1), FBJ murine osteosarcoma viral oncogene homolog B (△ FosB) and Brain-derived neurotrophic factor (BDNF). We also examined the striatum of Control and LRKO mice via immunohistochemistry for cFos, a marker of activated neurons. Collectively, our studies identify how loss of action via Nts-LepRb neurons disrupts protein expression and activation of the striatum, and suggest molecular changes that may promote development of obesity.

DOES A MORE REALISTIC APPROACH TO THE SHOOTER TASK REVEAL SIMILAR BIASES IN THE DECISION TO SHOOT?
Erica Ross
Home Institution: Harris-Stowe State University
Category & Time: Integrative Biology, Section 1, 1:00 PM - 2:00 PM
Poster: 192
Mentor(s): Joseph Cesario (Psychology), David Johnson (Psychology)

Understanding the factors that influence police officers' judgments to shoot unarmed targets is a question with considerable societal importance. Previous research using a "shooter task" has demonstrated that race and context (i.e., dangerous or safe) may bias decisions to shoot (Correll et al., 2002; 2011). However, such research has typically relied on stimuli with little relevance in the real world, such as still images. Because of real world implications of this question, we will test whether similar biases are obtained with more realistic stimuli. In our version of the shooter task, in addition to still images, participants will be shown video clips of individuals shooting guns or raising harmless objects. Participants will be given a button box labeled "Shoot" and "Don't Shoot" and told to shoot individuals with guns and avoid shooting those without guns. Insofar as videos are more realistic than pictures, they may provide better estimates of the magnitude of biases in the decision to shoot outside the laboratory. The results from this study may further our understanding of the factors that may influence the decision to shoot, with the eventual goal of reducing accidental shootings of unarmed suspects.

DIURNAL VARIATION IN THE ELECTRIC FISH PARAMORMYROPS KINGSLEYAE
Sarah Sam
Home Institution: Virginia Polytechnic Institute and State University
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:00 PM
Poster: 194
Mentor(s): Jason Gallant (Zoology), Monica Lucas (Zoology)

Mormyrid fish produce an electrical communication signal called an electric organ discharge (EOD). Temporal variation in EODs, such as differences in duration and complexity, convey important information between senders and receivers. EODs are generated through a mechanism similar to that of the action potential of a neuron, specifically using voltage-gated sodium channels. Recent work identified a sodium channel, Scn4aa, which is specifically expressed in electric organ of mormyrids. We hypothesize that the reduced expression of Scn4aa in the electric organ will lead to a decrease in the amplitude of the EOD. To test this hypothesis, we developed an EOD recording application to work with National Instruments data acquisition hardware using LabVIEW. We will use this application to determine if the mormyrid Paramormyrops kingsleyae exhibits natural diurnal variation in its EOD. Next, we will interfere with Scn4aa expression by injecting a morphilino into the electric organ. Morpholinos are small fragments of antisense RNA designed to perform targeted interference with protein translation, into electric organs.

SINGLE PROLONGED STRESS (SPS) MODEL OF POSTTRAUMATIC STRESS DISORDER (PTSD)
Rebecca Benjamin
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:00 PM
Poster: 195
Mentor(s): S Marc Breedlove (Neuroscience), Apryl Pooley (Neuroscience)

Posttraumatic Stress Disorder is an abnormal, prolonged stress response to a traumatic event that affects approximately 7% of the general population in the US. Debilitating symptoms of PTSD can impede the lives of affected individuals for years. My research focuses on the underlying neural mechanisms that cause some individuals to develop PTSD, especially the sex differences that moderate abnormal stress responses. I will use the Single Prolonged Stress model, one of the most replicated and validated PTSD animal models, to create a PTSD phenotype in rats. The effects of SPS have reliably been shown to recapitulate PTSD symptoms in humans. Males and females respond differently to traumatic stress; however, the neurological basis for this dichotomy is not fully understood. Several brain regions and chemicals have been implicated in contributing to this sex difference. In my research, I am focusing on the amygdala, hippocampus, and prefrontal cortex, which have neuronal projections to the hypothalamus, part of the HPA axis. The HPA axis is the primary stress circuitry, inducing the release of stress hormones from the adrenal cortex. To analyze these regions, I am focusing on the prevalence of glucocorticoid receptors and the immediate early gene cfos to determine whether there is a sex difference in the number or location of GRs or the magnitude of activation in any of these regions. Developing a better understanding the mechanisms that underlie PTSD is crucial for the proper diagnosis and treatment of this disorder.

THE TEMPORAL RELATIONSHIP BETWEEN ANDROGEN INDUCED REDUCTIONS IN MUSCLE BDNF MRNA EXPRESSION AND MOTOR FUNCTION IN A TRANSGENIC MOUSE MODEL OF SPINAL BULBAR MUSCULAR ATROPHY
Laurel Domino
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:00 PM
Poster: 196
Mentor(s): Katherine Halievski (Neuroscience), Cynthia Jordan (Neuroscience)

Spinal bulbar muscular atrophy (SBMA) is a degenerative neuromuscular disease that results in muscle weakness in the face, throat, and limbs and is also characterized by partial androgen-insensitivity. SBMA is linked to a polyglutamine repeat mutation of the androgen receptor (AR) gene, and symptoms of the disease are androgen dependent. Prior research (Halievski, unpublished) indicates that mRNA levels of brain derived neurotrophic factor (BDNF) decrease in skeletal muscles of mice exhibiting SBMA-like symptoms, with this deficit being androgen-dependent and correlated with motor dysfunction. However, whether the reduction in BDNF occurs before or after the accompanying drop in motor function is not known. If BDNF drops before symptoms emerge, it may cause or contribute to motor dysfunction; if it occurs after, it may result from or maintain symptoms. The present study will determine the time course of decline for BDNF mRNA and motor function in a transgenic mouse model of SBMA in which the disease allele is expressed only in muscle. Transgenic females in this model show progressive motor decline when treated with androgens. Wild-type and transgenic females received slow-release testosterone capsules and underwent daily motor function tests on 0-5 days of treatment. Hindlimb muscles were then collected on days 0-5 to measure BDNF mRNA. As prior research points to deficits in BDNF as a possible contributor to pathology in polyglutamine diseases, the results of this study may point to possible roles of BDNF's in understanding SBMA etiology and the search for therapeutic agents to treat this disabling disease.

GAME OF ROACHES: REMOTE CONTROLLED COCKROACH MOVEMENTS BY WAY OF STIMULATION OF THE CERCAL SYSTEM
Olivier Kayiranga
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:00 PM
Poster: 197
Mentor(s): Greg Gage (Backyard Brains)

Cockroaches have a rapid escape response system that uses sensory organs, such as the cercus and antennae, to detect and avoid predators. The typical response observed is a 90-180 degree turn. In my project I will explore these sensory system to determine whether cockroach movement can be coordinated in forward and reverse directions. Currently, stimulation of the antennae has only resulted in a pivot to the left and right. The goal is to develop a way to stimulate the cerci directly and to use that new method of stimulation to move the cockroach forwards and backwards. My hypothesis is that changing the polarity of the stimulation may also affect the directionality of the cockroach's movement. The hope is that cockroaches whose movements are controlled via mesh network can perform tasks that humans cannot, such as exploring collapsed buildings. Currently I have been able to electrically

stimulate a cockroach to pivot both left and right but also move forward. The hope is to be able to also initiate a backwards movement, and to ultimately accomplish all stimulation remotely.The hope is that augmenting the pulse from positive to negative may cause the cockroach forward whilst having a negative charge followed by a negative charge moves the organism backwards which can be tested by augmenting stimulation to produce such charges.

CULTURABLE SKIN MICROBIOME OF THE TOXIC ROUGH-SKINNED NEWT

Kimberly Brummell
Home Institution: University of North Carolina at Chapel Hill
Category & Time: Integrative Biology, Section 2, 1:00 PM - 2:00 PM
Poster: 198
Mentor(s): Heather Eisthen (Zoology), Patric Vaelli (Zoology)

Tetrodotoxin (TTX) is a neurotoxin associated with animals across a range of different phyla. TTX functions by blocking voltage-gated sodium channels, thereby inhibiting neurotransmission and causing eventual death. The rough-skinned newt, Taricha granulosa, has been found to produce extraordinarily high levels of the toxin due to a coevolutionary arms race with garter snakes. While it is commonly accepted that organisms evolve in response to environmental pressures, the mechanisms by which T. granulosa have evolved to produce unprecedented levels of TTX have yet to be understood. Our research seeks to understand the role of the newt's skin microbiome in TTX production. The microbiome, commonly defined as the collection of microorganisms associated with a given organism, has recently been implicated in the expression of various phenotypes in a number of animals. We have cultured and identified, via V4-V6 16S rRNA sequencing, a number of bacteria associated with the skin of T. granulosa. Given recent developments that suggest the microbiome can affect phenotype in a variety of contexts, we anticipate our findings to suggest that the toxic newt's microbiome has played an integral role in its production of TTX. This result would further support the hologenome theory of evolution, which proposes that an animal evolves via natural selection in concert with its microbiome, not as an individual organism.

DECREASE IN UCH-L1 PROTEIN AND MRNA WITH RESPONSE TO MPP+ IN MN9D DOPAMINERGIC CELLS

Samantha Drysdale
Home Institution: Northern New Mexico College
Category & Time: Integrative Biology, Section 3, 2:00 PM - 3:00 PM
Poster: 200
Mentor(s): Brittany Winner (Pharmacology & Toxicology)

This study investigates the expression of UCH-L1 protein in the presence of MPP+ in MN9D cells, specifically to determine if MPP+ administration can cause an increase in turnover rate of UCH-L1, to determine if MPP+ causes a reduction in the protein's half-life. The neurotoxicant used to review selective DAergic toxicity in studies of PD is MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine), which is a neurotoxicant precursor to its active metabolite MPP+. MPP+ selectively damages DAergic neurons in the SN of the brain leaving other less-susceptible DAergic neurons spared.As previously mentioned, studies indicate UCH-L1 protein increases in the arcuate nucleus (ARC) and decreases in the SN after MPTP treatment while mRNA levels for UCH-L1 increase in the ARC but do not change in the SN. With this evidence in mind, we can investigate UCH-L1 function in these regions, and determine why the response of UCH-L1 is different in the SN compared to the ARC. The treatment of MN9D cells with different concentrations of MPP+ in the presence of the macromolecule synthesis inhibitor, cycloheximide, will help to establish and turnover rate of the UCH-L1 protein. We hypothesize that the half-life of UCH-L1 will be decreased in the presence of MPP+ in the MN9D cells. A first step is establishing the cytotoxicity of MPP+ and cycloheximide.

NEURAL PATHWAYS MEDIATING THE ACUTE EFFECTS OF LIGHT ON BEHAVIOR IN DIURNAL AND NOCTURNAL SPECIES

Wes Smoot
Home Institution: Georgia State University
Category & Time: Integrative Biology, Section 3, 2:00 PM - 3:00 PM
Poster: 201
Mentor(s): Jennifer Langel (Neuroscience), Laura Smale (Psychology)

Mammalian temporal activity patterns differ with some species being active primarily during the day (diurnal) and others primarily at night (nocturnal). Light affects the daily patterning of behavior by synchronizing the internal timing system to environmental light/dark cycles, and by directly increasing or decreasing activity. These acute effects of light (masking) differ in diurnal and nocturnal species; light increases arousal in diurnal species, and decreases it in nocturnal ones. The pathways mediating these masking behaviors are not well understood. Pituitary adenylate cyclase-activating polypeptide (PACAP), a neurotransmitter stored in melanopsin-expressing retinal ganglion cells, may play a role. We used immunohistochemistry (IHC) to label PACAP fibers in the nocturnal Long Evans (LE) rat brain. To determine whether PACAP fibers in specific brain regions originate in the retina and whether such fibers are crossed, we evaluated PACAP staining in bilaterally and unilaterally enucleated LE rats. We are investigating PACAP fiber projections in the intergeniculate leaflet (IGL) and olivary pretectal area (OPT), two brain regions potentially involved in masking. We are also using immunofluorescence (IF) to label glutamate decarboxylase (GAD), a marker for GABA (an inhibitory neurotransmitter), and for c-FOS, a marker of neuronal activity, in nocturnal LE rats and diurnal grass rats. This labeling procedure will shed light on the internal circuitry of retinorecipient brain regions of diurnal and nocturnal mammals, and will help determine whether depolarization of melanopsin neurons projecting via PACAP-containing axons could elicit inhibitory or excitatory effects on cells within the IGL and/or OPT.

CHEMOSENSORY DETECTION OF TETRODOTOXIN IN THE ROUGH-SKINNED NEWT (TARICHA GRANULOSA)
Justin Merkel
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 3, 2:00 PM - 3:00 PM
Poster: 202
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 aggregate in groups ranging 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 behavioral data suggest that newts are attracted to TTX, and electrophysiological data indicate that TTX evokes an odorant response in approximately 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.

DEVELOPMENT OF THE PLAQUE-FORMING CELL ASSAY AND IGM/IGG ELISA TO ASSESS ANTIBODY RESPONSE TO SHEEP RED BLOOD CELLS IN MICE
Jenna Bursley
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 3, 2:00 PM - 3:00 PM
Poster: 203
Mentor(s): Cheryl Rockwell (Pharmacology and Toxicology)

Nuclear factor erythroid 2-related factor 2 (Nrf2) is a transcription factor that is activated by oxidative and electrophilic stress. Recent studies show that Nrf2 plays a role in B cell differentiation and function in response to LPS, a T cell-independent B cell activator. But, the role of Nrf2 in regulating B cells activated with other stimuli or under in vivo conditions has not been characterized. The purpose of the present studies was to compare the induction of antibody-producing B cells in response to sheep red blood cells (sRBC) in wild-type and Nrf2-null mice. In contrast to LPS, B cell response to sRBC requires the participation of other cell types, including dendritic cells/macrophages and T cells. In order to assess response to sRBC, we first had to develop the methodology to detect antibody-producing B cells. We used multiple approaches, including IgM and IgG enzyme-linked immunosorbant assays (ELISA) and plaque-forming cell assay. We were able to successfully detect antibody production using all three approaches in wild-type C57Bl/6 mice. Although we have initiated studies to compare antibody production in response to sRBC in wild-type and Nrf2-null mice, we have only been able to implement two studies and results are inconclusive thus far in part due to high variability. Thus, more studies will be needed to determine the role of Nrf2 in antibody production in response to sRBC in mice. (This work is supported by NIH grant: ES018885.)

THE EFFECTS OF ENDOCRINE DISRUPTING CHEMICALS AND CHRONIC ESTRADIOL-17β (E2) EXPOSURE ON THE TUBEROINFUNDIBULAR DOPAMINERGIC (TIDA) NEURONS OF THE HYPOTHALAMUS.
Alana Page
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 3, 2:00 PM - 3:00 PM
Poster: 204
Mentor(s): PS MohanKumar (Pharmacology, Veterinary Medicine), Sheba MohanKumar (Pharmacolgy & Toxicology, Veterinary Medicine), Elahé Crockett (Medicine)

Introduction: Endocrine disrupting chemicals (EDCs) such as estradiol (E2), bisphenol A (BPA) and diethyl hexyl phthalate (DEHP) may play a role in breast cancer development. Hyperprolactinemia is frequently associated with breast cancer and related to low levels of hypothalamic dopamine (DA). However, it is unclear if EDC exposures are directly involved in the onset of hyperprolactinemia. Hypothesis: Prenatal programming with BPA and/or DEHP (to mimic environmental exposures) followed by exposure to E2 during adulthood (to mimic oral contraceptive use) will result in oxidative stress-related damage of DA neurons leading to reduced synthesis of DA, which would result in hyperprolactinemia. Methods/Results: Pregnant Sprague-Dawley rats were treated orally with 5μg/kg BW/day of BPA, 7.5mg/kg BW/day of DEHP, or both from day 6-21 of gestation. Female offspring were implanted with s.c. slow-release E2 pellets (releases 20ng of E2/day for 90 days) when 3 months old. Following 90 days of exposure, offspring were euthanized. Their brains were removed, frozen, and sectioned and serum prolactin analysis is underway. The hypothalamus will be microdissected to measure superoxide levels and analyzed for DA levels using HPLC. We anticipate that E2 exposures in adulthood would increase superoxide levels in the hypothalamus, decrease DA levels, and increase prolactin. This effect would be aggravated in offspring that are prenatally exposed to BPA and/or DEHP. Conclusion: Results implicate EDC exposures in hyperprolactinemia and, possibly, breast cancer development. Support: A.P. is a REPID scholar, support by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

AUTO FEEDBACK SYSTEM OF MESENTERIC ARTERIES AND VEINS AFFECTED BY THE G-PROTEIN SIGNALING MECHANISM
Holly Semma
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 4, 2:00 PM - 3:00 PM
Poster: 206
Mentor(s): Elahé Crockett (Medicine), James Galligan (Pharmacology & Toxicology), Hui Xu (Pharmacology & Toxicology)

Introduction: Alpha-adrenergic receptors (alpha-AR) have an essential role in blood pressure regulation. Alpha-1-AR, lined along the smooth muscles of arteries and veins, exhibit vasoconstriction when activated by norepinephrine (NE). NE is released from sympathetic nerves that supply arteries and veins. Alpha-2-AR, located on sympathetic nerve terminals, inhibit NE release through negative feedback mediated by nerve terminal G-proteins. Our lab is interested in G-protein control of NE release and its importance for blood pressure regulation. We will use a mutant mouse in which G-protein signaling is disrupted. **Methods/Results:** Creation of NE dose response-curve (0.01 μM - 30 μM) of mesenteric arteries and veins. Qualitative data analysis displayed the NE curve as left-shifted in veins. Quantitative data analysis showed that the threshold concentration in veins was much lower than arteries. Furthermore, EC50 is the concentration that produces 50% of maximum response, and was used to compare NE potency within the blood vessels. Veins had an average EC50 of 7.22 ± 0.43, while arteries had an average EC50 of 6.02 ± 0.06. This difference is statistically significant (t-test, p=0.00853). **Conclusion:** Veins are more sensitive to NE than arteries in the mouse mesentery. Future studies include nerve stimulation of the mesenteric blood vessels to better examine the vasoconstriction without the presence of alpha-2-AR. This study in progress of the alpha-AR in blood pressure regulation can help us better understand hypertension, which affects one billion individuals worldwide. **Support:** H.S. is a REPID scholar, supported by NIH-5-R25-HL108864 award to Elahé Crockett, REPID-Program Director.

GENERATION OF A NOVEL MOUSE MODEL TO STUDY NEUROTENSIN RECEPTOR-1 NEURONS
Trevor Lewis
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 4, 2:00 PM - 3:00 PM
Poster: 207
Mentor(s): Gina Leinninger (Physiology), Hillary Woodworth (Physiology)

Neurotensin (Nts) is a neuropeptide that acts via neurons expressing neurotensin receptor 1 (NtsR1). We seek to understand the precise neuronal mechanisms by which Nts neurons in the lateral hypothalamic area (LHA) regulate energy balance via NtsR1. LHA Nts neurons project within the LHA and to the ventral tegmental area (VTA), thus we hypothesized that these regions must contain NtsR1-expressing neurons. However, a commercially available transgenic mouse model identified few NtsR1 neurons in the LHA or VTA, far fewer than predicted by in situ hybridization. We therefore generated $NtsR1^{IRES\text{-}Cre}$ knock-in mice that allow us to selectively identify and manipulate the full cohort of NtsR1 neurons. We crossed $NtsR1^{IRES\text{-}Cre}$ mice onto a Cre-inducible green fluorescent protein (GFP) reporter strain to induce GFP expression in NtsR1 neurons ($NtsR1^{IRES\text{-}Cre}$;GFP mice), thereby permitting their visualization. Analysis of $NtsR1^{IRES\text{-}Cre}$;GFP mice identifies many GFP-expressing (e.g. NtsR1) neurons in a similar distribution to that predicted by in situ hybridization studies, suggesting that this model reliably identifies NtsR1 neurons. We then used $NtsR1^{IRES\text{-}Cre}$;GFP mice to identify the NtsR1-expressing neurons in the LHA and VTA. NtsR1 neurons in the VTA co-expressed tyrosine hydroxylase, a marker of dopamine neurons that are crucial mediators of motivated behavior. NtsR1 neurons in the LHA co-localized with orexin, a neuropeptide that promotes feeding and alertness. Collectively, these findings suggest that LHA Nts neurons regulate molecularly distinct populations of NtsR1 neurons in the VTA and the LHA to modulate energy balance.

NEURAL RESPONSE OF MEPD IN MALES TO FEMALE ODORS AND THE ROLE OF ANDROGEN RECEPTOR
Shakeera Walker
Home Institution: Montclair State University
Category & Time: Integrative Biology, Section 4, 2:00 PM - 3:00 PM
Poster: 208
Mentor(s): Marc Breedlove (Neuroscience), Nicholas Hobbs (Neuroscience)

Rodents are able to communicate with one another through chemical signals in odors and pheromones. The medial amygdala is a region in the brain where signals from the main and accessory olfactory systems converge. As such, the medial amygdala, specifically its posterordorsal aspect (MePD), plays a major role in the sexual behavior of rodents. The MePD is sexually dimorphic, supporting the notion that structural differences in the brain may be related to behavior. Androgen receptor (AR) is present in brain regions that regulate sexually differentiated behaviors. AR may play a role in the sexual differentiation of social preferences and neural responses to odors. We hypothesized that the neural response of the male MePD to opposite-sex odor is affected by the presence of AR. We also hypothesized that laterality exists in the neural response of the MePD to female odors. We tested this hypothesis by exposing wildtype and induced testicular feminization mutant (iTfm) mice to either urine from female mice or water and measuring the neural response via cFos expression. We used iTfm mice to investigate AR's role in masculine responses because they lack a functional AR. Consistent differences in the behavior and neural responses of iTfm versus wildtype males will reveal androgen receptor's role in the neural response of the MePD to female odors.

PEPPERMINT IS THE NEW VANILLA: CHANGING OLFACTORY MEMORIES THROUGH OPERANT CONDITIONING IN COCKROACHES
Alexander Clark
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 4, 2:00 PM - 3:00 PM
Poster: 209
Mentor(s): Greg Gage (Backyard Brains)

All cockroaches are capable of detecting odors through their antennae; it has been observed that roaches can be operantly conditioned to show a preference for a peppermint odor, which they are naturally averse to, over a vanilla scent and the memories of this preference were retained for up to a month. The goal of this research is to observe that retention and then write over or delete that memory with sensory overload, using lights and other odor stimuli between training sessions. The cockroaches are tested of their preference of peppermint and vanilla at the beginning of the experiment and after training sessions have taken place. Training is conducted in order to have the cockroaches prefer the scent of peppermint over vanilla. The insects will then be flushed with either strong odor sources, flashing lights, or a combination immediately after a training session is completed and their retention of the memory will be monitored. This experiment is an important illustration of the plasticity of memory; by using an animal model, we can begin to better understand how memory is created and retained. Another goal of this study is to achieve results using affordable and effective materials that could be assembled in classroom.

SHOCKS AND STINGS: MICROSTIMULATION OF SCORPION DEFENSIVE BEHAVIOR

Dylan Miller
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 4, 2:00 PM - 3:00 PM
Poster: 210
Mentor(s): Greg Gage (Backyard Brains)

A scorpions' experience of the world is primarily dependent upon mechanosensation. Previous studies on scorpions have indicated that receiving direct tactile stimulation to their legs induces a defensive behavior such as stinging in the perceived direction of where the stimulation is coming from. The goal of this research is to remotely induce this behavior through electrical microstimulation of the scorpions' leg nerves. The scorpion surgery includes interfacing implanted wire electrodes with the leg nerves, which are then paired with the RoboRoach microstimulator from Backyard Brains. Through it, aspects of this defensive behavior will be studied, such as what angle the sting will be in relation to stimulation, and how fast the end of the tail moves in response to it, with the prediction that the scorpion will reliably sting to the side the electrical stimulation is provided. Further, this is being used as a means to explore scorpion behavior and neurophysiology, about which little is currently known.

NOTES AND NEURONS: THE EFFECTS OF AUDITORY STIMULI ON THE AUTONOMIC NERVOUS SYSTEM

Christopher Hall
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 5, 3:00 PM - 4:00 PM
Poster: 212
Mentor(s): Erica Wehrwein (Physiology)

The goal of this experiment is to observe the effect of various auditory stimuli on the autonomic nervous system. We predict that auditory stimuli, depending on their nature, will affect a specific branch of the autonomic nervous system. For example, "relaxing" stimuli such as guided meditations and slow, quiet music will have an excitatory effect on the parasympathetic nervous system while "energizing" stimuli such as fast, loud music will have an excitatory effect on the sympathetic nervous system.

SILENCING RNA KNOCKDOWN OF TGFβ RECEPTOR II IN SEA LAMPREY DURING METAMORPHOSIS

Jeffrey Hamilton
Home Institution: Rocky Mountain College
Category & Time: Integrative Biology, Section 5, 3:00 PM - 4:00 PM
Poster: 213
Mentor(s): Yu-Wen Chung-Davidson (Zoology, Neuroscience), Weiming Li (Fisheries and Wildlife), Chu-Yin Yeh (Physiology)

Sea Lamprey (Petromyzon marinus) is one of the most basal extant vertebrates, providing an excellent model to study how organ development evolved. Sea Lamprey has three life phases: larva, parasitic adult, and fecund adult. During the metamorphosis from larva to parasite, lamprey goes through a profound organ recession and restructuring and morphological changes. The digestive system of lamprey changes dramatically with the obliteration of bile ducts and gallbladder; this natural model provides an advantageous system to study organ development. Previous studies indicate that the transforming growth factor beta (TGFβ) pathway plays a role in lamprey metamorphosis. To study how the TGFβ pathway influences metamorphosis, we developed siRNA to knock down TGFβ pathway related genes. We targeted TGFβRII(receptor II) and determined at which time points the TGFβRII gene was significantly knocked down after the TGFβRII siRNA was delivered. We treated larvae with TGFβRII siRNA for 3, 6, 12, 24, 48, and 96 hr and used RT-qPCR to measure the level of TGFβRII transcripts as well as levels of TGFβI, TGFβII, and TGFβRI transcripts for compensatory activities. Our results indicate that treatment of siRNA reduced levels of TGFβI, II, and their receptors in larval liver and intestine. TGFβRII is reduced at 24 hr and later in liver—interestingly, TGFβI and TGFβII are also changed after 24 hr. These results show that the effects of TGFβRII siRNA have effects not only on the target gene, but also on other genes in the TGFβ pathway.

THE EFFECT OF OVARIAN HORMONES ON MATERNAL BEHAVIOR

Savanna Tierney
Home Institution: San Diego State University
Category & Time: Integrative Biology, Section 5, 3:00 PM - 4:00 PM
Poster: 214
Mentor(s): Zachary Grieb (Neuroscience), Joseph Lonstein (Psychology)

The ovarian hormones estradiol and progesterone are known to contribute to the onset of maternal behavior following parturition in female rodents. However, less is understood about endocrine or other factors that attenuate maternal behavior at the end of lactation. Ovarian release of progesterone increases across the postpartum period beginning around postpartum day 4 (PPD 4) and decreases back to parturition levels around PPD 16, while estradiol remains low. Using ovariectomy (OVX) we investigated the potential role of ovarian hormones on termination of maternal behavior. As progesterone switches from promoting to inhibiting maternal behavior at the very end of pregnancy, we hypothesize it may also contribute to the termination of maternal behavior postpartum. Specifically, removal of ovarian progesterone via OVX would delay the decline in maternal behavior compared to Sham controls. On PPD2, female rats were assigned to Sham or OVX surgery conditions and maternal behavior was observed 4 times daily from PPD7-19. Because pup contact decreases over the postpartum period and also affects dams anxiety, we are observing dams' behaviors in an Elevated Plus Maze (EPM), a classic measure of anxiety-related behaviors on PPD20. We predict that if OVX prevents the decline in maternal behavior, those dams will remain less anxious on the EPM compared to the Sham group. Better understanding of the role that ovarian hormones play in maintaining and terminating maternal behavior in rats may provide insight into the underlying mechanisms that contribute to postpartum anxiety disorders in women.

SEX DIFFERENCES IN PUBERTALLY BORN CELLS WITHIN THE BASOLATERAL AMYGDALA

Corey Calhoun
Home Institution: Green Mountain College
Category & Time: Integrative Biology, Section 5, 3:00 PM - 4:00 PM
Poster: 215
Mentor(s): Margaret Mohr (Neuroscience), Cheryl Sisk (Neuroscience), Nancy Staffend (Neuroscience)

Recent literature has shown that cells are added to sexually dimorphic regions of the rodent brain during adolescence implicated in the expression of mature sexual behavior. Sex differences also become apparent in social behaviors during adolescence. Therefore, it is beneficial to examine brain regions that are imperative to social behavior, such as the basolateral amygdala (BLA). The BLA is involved in motivated behaviors, specifically assigning negative emotional valence associated with avoidance behavior. During human adolescence there are distinguishable sex differences in social behavior, including a female bias in depression. Dysregulation of BLA function has been implicated in this sex-difference; it is possible that structural sex-differences in the BLA that arise during adolescence may contribute to later sex-differences in the diagnosis of depression. The present study aims to elucidate whether there are sex differences in cell addition within the BLA and if so, whether these differences are due to cell proliferation and/or cell survival. Thirty-six male and female Sprague-Dawley rats received a single injection of the birth-date marker Bromodeoxyuridine (BrdU) at the onset of puberty (post-natal day 30). Perfusions were performed 1d, 7d, and 21d after the BrdU injection. The brains were sectioned at 40μm and stored in cryoprotectant at -20˚C. One series of tissue was immunohistochemically labeled for BrdU and another was Nissl-stained. The tissue was analyzed using light microscopy to determine if structural sex differences in cytogenesis were present, and if so, whether they were due to cell proliferation and/or cell survival.

SELECTION PRESSURES CAUSE ADAPTIVE DIVERGENCE IN BRAIN REGIONS OF THREESPINE STICKLEBACKS (GASTEROSTEUS ACULEATUS)

Katelyn Doolittle
Home Institution: Baker University
Category & Time: Integrative Biology, Section 5, 3:00 PM - 4:00 PM
Poster: 216
Mentor(s): Jason Keagy (Zoology)

The brain is of central importance for organismal performance and fitness. Many studies seeking to address evolutionary explanations of cognition focus on diverse taxonomic groups, which often have long complicated evolutionary histories that obscure the signal of selection. However, marine threespine sticklebacks, Gasterosteus aculeatus, colonized multiple freshwater lakes in British Columbia post glaciation only 12,000 years ago and subsequently adapted to benthic and limnetic ecological niches, in the process becoming reproductively isolated. Thus, this group of recently evolved species offers a natural model to study cognitive evolution in response to selection pressures. We are studying the ways in which selection pressures associated with benthic and limnetic environments shaped neuroanatomical evolution. To do this, we collected fish samples from three lakes with benthic and limnetic species and subsequently employed magnetic resonance imaging (MRI) to generate three-dimensional images of intact brains, allowing the volumes of various brain regions to be measured accurately. Previous studies have established significant cognitive differences between benthic and limnetic sticklebacks, including visual and olfactory perception, spatial learning, and social learning. We predict that benthics, which forage in visually-obscured habitats, therefore requiring keen olfaction, will have larger olfactory bulbs and smaller optic tecti than limnetics. Additionally, we expect the telencephalon, which is known to be involved in spatial, social, and associative learning will be larger in the benthic species which is better at spatial and social learning. The results of this study will answer whether brain region size differences can indeed evolve rapidly due to environmental selection pressures.

A CLOCKWORK COCKROACH: DETERMINING THE NATURAL CIRCADIAN RHYTHM OF THE PERIPLANETA AMERICANA

Marta Mazur
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 6, 3:00 PM - 4:00 PM
Poster: 218
Mentor(s): Greg Gage (Backyard Brains)

The brain has neural circuits that track the position of two celestial bodies: the center of the earth for balance and the position of the sun for our daily circadian rhythm. It is possible to measure the nervous system's natural circadian rhythm by monitoring activity in the absence of external cues. As the internal biological clock has remarkable low variance, but not exactly 24 hours, subjects shift into a state known as "free running," whereas activity shifts predictably forwards or backwards on successive days. The goal of this research is to design an apparatus that adjusts the light/dark cycles from a 12:12 cycle to 24 hours of complete darkness in an attempt to observe natural circadian rhythm in the Periplaneta Americana, commonly known as the American cockroach. Within the testing apparatus there is an exercise wheel and there are two types of motion sensors to collect the amount of activity produced by the cockroach. The experiment is broken into two parts, five days of a 12-12 light/dark cycle, then ten days of complete darkness. The circadian rhythm apparatus is designed to be usable in the classroom so that students may gain a better understanding of this science and be encouraged to engage in critical experimentation. It will also be used to easily gather data to observe the effect that light alteration has on the circadian rhythm of a cockroach.

A RED LIGHT DISTRICT FOR FLIES: ILLUMINATING AFFORDABLE OPTOGENETICS FOR THE CLASSROOM

Cort Thompson
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 6, 3:00 PM - 4:00 PM
Poster: 219
Mentor(s): Greg Gage (Backyard Brains)

Optogenetics enables the manipulation of neural activity in free moving organisms with millisecond precision by making modified ion channels sensitive to a particular wavelength of light. Unfortunately today, most optogenetics methods are expensive and out of reach beyond well-funded institutions. This is regretfully common within the field of neuroscience and most students aren't exposed to any neuroscience concepts until advanced undergraduate and graduate education. Making neuroscience methods such as optogenetics available in grade-school classrooms is important for introducing students to the excitement of neuroscience. Neuroscience is a rapidly growing field and bringing the most cutting edge methodologies, such as optogenetics, to the classroom will play a role in expanding the field of neuroscience in the future. Using a red-shifted opsin (ReaChR) that has been developed to allow light to penetrate through the exoskeleton of insects and activate target cells, I will develop protocol and experiments using affordable tools and materials (under 100$) to observe which neural pathways are involved in the Proboscis Extension Response(PER) and courtship behaviors. Creating new tools for understanding the systems behind animal behaviors is important not only because it can inspire interest in neuroscience and encourage critical thinking in youths, but to eventually gain a further understanding of the mechanisms of neural substrates similar to those of humans via animal models such as drosophila.

DEVELOPMENT AND VALIDATION OF A DIFFICULTY OF PROCUREMENT (DP) SCORE TO RANK CARNIVORANS

Sean Kelley
Home Institution: Emory University
Category & Time: Integrative Biology, Section 6, 3:00 PM - 4:00 PM
Poster: 220
Mentor(s): Cybil Cavalieri (Zoology, MSU Museum), Barbara Lundrigan (Zoology, MSU Museum)

Procuring food is pivotal to a species survival and reproduction and is central to its behavior, ecology, and evolution. Quantifying how difficult a diet is to procure for carnivores is more complex than for herbivores because their diet is active and hostile. We here develop a method for quantifying 'difficulty of procurement' for predatory species in the Order Carnivora. Numerous factors are involved in making a predator's diet difficult including group size and weight and height asymmetry of predator and prey, killing technique, and environmental ruggedness. In our score, species are penalized for hunting in groups and rewarded for procuring prey larger than themselves, having a demanding killing technique, and hunting in difficult to transverse environments. Each predator-prey dyad receives a difficulty of procurement (DP) score that is weighted by the percent of prey species in the predator's diet, summed and divided by the total number of prey items. To validate the score, we compare it with the Manly-Chesson indices and hunting success rates for the various prey items. More difficult prey should be less preferred and be hunted with lower success than easier to procure prey. Once the DP score has been validated, we will use it in a larger study to test the hypothesis that trade-offs exist between dietary challenge (i.e., 'take down' difficulty), and the rate and timing of skull development, such that species with more 'difficult' diets reach morphological landmarks (e.g., age at adult skull morphology) later relative to other life-history events.

GENETIC BASIS OF FEMALE MATE DISCRIMINATION IN RECENTLY DIVERGED SPECIES OF THREESPINE STICKLEBACKS

Jonatan Martinez
Home Institution: Michigan State University
Category & Time: Integrative Biology, Section 6, 3:00 PM - 4:00 PM
Poster: 221
Mentor(s): Jason Keagy (Zoology)

Sexual isolation and the mechanisms keeping species distinct are essential processes of evolution. The genetic basis of sexual isolation until recently has been rarely explored. We do this using the threespine stickleback, Gasterosteus aculeatus. Threespine sticklebacks were originally marine fish; after the retreat of glaciers 12,000 years ago, some populations colonized newly formed freshwater lakes in British Columbia. In some of these lakes, the populations further adapted to two ecological niches in the lake, called "benthic" and "limnetic", and became reproductively isolated. We explore gene expression patterns in female limnetic and benthic sticklebacks from two lakes in British Columbia in response to conspecific and heterospecific courtship. In addition, we will determine how gene expression patterns differ and/or coincide between the species. We use three different treatments to allow us to distinguish genes being expressed when females are making mate choice decisions. We recorded all behavior while a gravid (has

fully developed eggs) female was either: 1) swimming with a non-gravid female (social behavior treatment); 2) courted by a conspecific male; or 3) courted by a heterospecific male. After each trial, females were euthanized and their brains dissected and preserved. We will use RNA-seq to quantitatively analyze gene expression profiles across species and treatment groups. This study will inform us on the genetic basis of reproductive isolation through mate discrimination and set the stage for future studies on gene expression in a model system of evolutionary biology.

CAUSES AND CONSEQUENCES OF NEGATIVE INCENTIVE CONTRAST OF NECTAR FEEDING BEES

Jennifer Gravrok
Home Institution: University of Wisconsin - Superior
Category & Time: Integrative Biology, Section 6, 3:00 PM - 4:00 PM
Poster: 222
Mentor(s): Fred Dyer (Zoology)

Forager honey bees, Apis mellifera, continuously make decisions about where to forage and what food to bring back to the hive, a task that is complicated by the fact that they live in a dynamic environment where location and quality of food changes rapidly and unpredictably. As in many animals, bees display a phenomenon called negative incentive contrast, which is seen when a formerly good reward is no longer acceptable, because of a brief experience with a better reward. Negative incentive contrast is one of several mechanisms enabling honey bees to adjust to changing rewards. Through a study to explore mechanisms and adaptive significance of this phenomenon, we studied spontaneous behavioral responses (proboscis extension reflex) to different sucrose solution concentrations. Returning nectar foragers were collected and fed one of three sucrose concentrations (10%, 30%, and 50% w/v), then tested for their sucrose threshold responses on an ascending or descending series of concentrations: 0.1%, 0.3%, 1%, 3%, 10%, and 30% sucrose (w/v). Although both prefeeding treatment and ordering of the test concentrations might be expected to produce a negative incentive contrast effect, we found only an effect of the prefeeding treatment. This may mean that negative incentive contrast effects are mediated only by the ingestion of reward, not by the sensory experience of sugar concentration. This research will be replicated with bumble bees (Bombus impatiens) and free flying honey bees to compare among species and to a more naturalistic foraging task.

MECHANICAL ENGINEERING

DESIGN OF A SLIDING RACK FOR TEMPERATURE SENSOR ARRAYS

Tingyuan Zhang
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 224
Mentor(s): Xiaobo Tan (Electrical And Computer Engineering)

This research aimed to design and manufacture an apparatus that holds an array of temperature sensors measuring the surface temperature distribution of a large indoor water tank in the Smart Microsystems Lab at MSU. The requirements of this apparatus include being able to hold 20 to 40 temperature sensors and being able to slide along the tank. There are two challenges. First, due to the large tank size (15 feet long, 10 feet wide), the temperature sensor rack needs to be wide, which tends to bend in the middle, making it difficult to maintain all sensors in the same horizontal plane. Second, it is also challenging to make sure the sensors are in the same plane during sliding. Several designs have been explored to address these challenges. First, a track-and-wheel mechanism is investigated that enables the sliding of the rack while enhancing the strength of the beams. It is found that this approach would result in high cost and limited flexibility for moving the rack. The second approach, which is promising, uses 80/20 aluminum frames to realize the supporting beam and the sliding rails on the slides. The latter design features advantages of strong beam support and low construction cost. In addition, it allows easy mounting of 3D-printed sensor holders. The manufacturing of the designed sensor rank is underway.

A METHOD OF DOCUMENTING IN VIVO HUMAN ANKLE STIFFNESS DURING WALKING

Katie Landwehr
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 225
Mentor(s): Jerrod Braman (Radiology), Roger Haut (Radiology), Feng Wei (Radiology)

In order to create useful biofidelic surrogate devices, biomechanical parameters of various joints must be defined. Previous experiments have been conducted to determine human ankle stiffness but the experiments were limited to either rotational motions or from cadaver tests. The current study utilizes a method to document the *in vivo* human ankle stiffness in internal-external rotation, inversion-eversion, and plantar-dorsiflexion during walking. Subjects were outfitted with retro-reflective markers, as defined by the multi-segmented lower body Oxford Foot Model. Several anthropological measures were made in order to complete the subject-specific model. Subjects were initially measured in a static pose, which was followed by several walking trials across a raised track with an embedded AMTI force plate. The lower extremity motions were captured and synchronized to the force plate data using a Vicon Motion Capture System. For this study, hind foot rotations relative to the tibia and resistive moments of the ankle were of interest. Plots of the resistive moments versus rotations along the axes of internal-external rotation, inversion-eversion, and plantar-dorsiflexion were created, and the linear region of each loading curve was used to determine the stiffness of the ankle in these three directions. The ankle stiffness values will then be compared with those determined in the previous studies noted above. The results of the study will be used in the design of a future surrogate ankle in order to assess footwear for the workplace and for athletic competition.

IMPLEMENTING WINDKESSEL MODELS TO DEFINE BOUNDARY CONDITIONS IN HEMODYNAMIC SIMULATIONS
Sara Knoedler
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 226
Mentor(s): Seungik Baek (Mechanical Engineering)

Simulating the blood flow in an abdominal aorta or carotid artery, that is either a healthy or diseased artery, is challenging due to the different factors that complicate the various boundary conditions in physiological ranges. In order to better understand the flow through the arteries, this project explores the use of relatively new software, SimVascular, in simulating the flow through the different geometries. To aid students and researchers in providing the step-by-step instructions of creating a successful simulation with the parameters used, a methodology was created in the form of a website. The website aims at promoting some of the benefits of SimVascular and providing a process that is easier to understand through the use of different website formatting abilities in order to create the manual. One tactic to make the instruction manual more clear is to have Graphic Interchange Format (GIF) video clips, which repeatedly replay small parts of the process. The mixture of GIF's and outlined text instruction creates a manual that is easier to navigate and successfully follow a procedure to complete a simulation. One goal for the manual is to outline a specific simulation process and make it accessible to others that may be using the hemodynamic software in the future.

MODELING THE RESPONSE OF BLOOD VESSELS TO BLOOD FLOW AND SHEAR STRESS
Hollie Adejumo
Home Institution: University of Maryland Baltimore County
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 227
Mentor(s): Seungik Baek (Mechanical Engineering), Hailu Getachew (Mechanical Engineering)

A change in blood flow results in a deviation toward the baseline of wall shear stress in physiological conditions. Endothelial cells, which are sensitive to changes in shear stress, synthesize and secrete endothelium-derived nitric oxide (NO). One of the main effects of NO is the activation of Matrix Metalloproteinases (MMPs), which are responsible for the degradation of the extracellular matrix. NO is also involved with the vessel vasodilation response to increased flow. When endothelial cells are impaired for a prolonged period, the vascular structure can undergo permanent changes and vascular diseases, such as aneurysms and stroke, may develop. This study investigates prior research and experimental findings to understand blood vessel response to changes in blood flow and shear stress conditions. Understanding this process is essential to expanding the knowledge about normal artery responses and the progression of common vascular diseases. A literature study will be conducted in order to understand the cascade of events that follow changes in blood flow and pressure on blood vessel walls, and furthermore determine the relationship between these changes and arterial adaptations. The C++ computational code will be utilized in order to develop a robust computational model that fits experimental data and interpretations from literature. This literature review will provide a detailed understanding of both the chemical and mechanical responses of the blood vessel to physiological changes that a normal blood vessel would experience. Acknowledgements: Financial support for this work was provided, in part, by the BEACON Center and NSF CAREER Grant (CMMI-1150376).

STRESS ANALYSIS OF COMPOSITES WITH VARIOUS HOLE FORMATIONS
Michael Hamilton
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 1, 1:00 PM - 2:00 PM
Poster: 228
Mentor(s): Dahsin Liu (Mechanical Engineering)

Testing the various uses of composite parts could lead to more frequent usage of them in future vehicle designs. In this study, composite plates are created using orthogonally woven glass fabric and an epoxy matrix, which mixes a resin and a hardener together. The process to create the composite material, i.e. infusing the glass fabric with the matrix, is called VARTM (Vacuum Assisted Resin Transfer Molding). The glass-epoxy mixture is then cured at a high temperature for solidification. The cured fiber composite is a stiff but light material. Although composites are created to be light and stiff, it is necessary to test the strength of the composite material with various geometries. The goal of this research is to investigate the stress and strength of the glass/epoxy composite with a loaded hole. In this study, the composite will be pulled apart from its end and the hole until significant damage takes place. Various hole- formations, including drilling, stitching, molding and rearranging, are of interest. The testing has not occurred as of yet, but in this study I expect that even though the area around the hole may be weakened, the material will still be rather resistant to being pulled apart.

LOW REYNOLDS NUMBER VALIDATION OF KUTTA-JOUKOWSKI THEOREM
Dominic Roberts II
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:00 PM
Poster: 230
Mentor(s): Patrick Hammer (Mechanical Engineering), Manoochehr Koochesfahani (Mechanical Engineering), David Olson (Mechanical Engineering)

Classical theories have been developed for ideal (inviscid) flows around thin wings that predict the aerodynamic forces, specifically the lift force. The most famous among these is the Kutta-Joukowski theorem, which states that the lift is proportional to the circulation around the airfoil. However, the applicability of this theorem to flows at low Reynolds number, where the ideal flow assumption is invalid, remains in question. Thus, the purpose of the present study is to study the validity of the Kutta-Joukowski theorem using a computationally driven approach where the flow field information and force data are directly available, therefore allowing the examination of the relation between the lift force and airfoil circulation. The findings for a NACA-0012 airfoil at a Reynolds number of 12,000 suggest that the Kutta-Joukowski theorem works well, even at lower Reynolds numbers, for a range of angles of attack.

THIN FLEXIBLE SENSORS IN THE STUDY OF SKIN LOADS AS THEY RELATE TO WOUND FORMATION

Jessica Buschman, Jared Gaumer
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:00 PM
Poster: 231
Mentor(s): Tamara Reid Bush (Mechanical Engineering), Junghoon Yeom (Mechanical Engineering)

Wound formation is a major topic of research within the field of biomechanics. Decubitus ulcers (also known as pressure ulcers) cost over one billion dollars per year for the healthcare industry (Bansal et al., 2005). These ulcers form based on a combination of internal and external factors, which makes them difficult to prevent (Bansal et al., 2005). However, research studies show that a primary factor in causing these wounds is normal and shear loading. (Manaorama et al., 2010) This combination of loading is often difficult to measure on the skin, as it requires a thin and flexible instrument that can go between a person and their wheelchair or bed. In attempts to determine more effective preventative measures for these skin wounds, the use of piezoelectric film sensors is being explored. Piezoelectric film sensors have the capability of measuring shear loading and producing an electrical voltage response. Furthermore, these thin-film sensors are compact and flexible, allowing them to fit easily on the human skin without compromising the skin or person. Previous research shows piezoelectric sensors being used in biomechanics, such as with biomechanical implants (Lajnef et al., 2008) and facial injury assessment (Hampson, 1995). Research on foot wounds used piezoelectric film sensors to study tissue breakdown in the foot (Akhlaghi and Pepper, 1996). Our study seeks to validate the use of piezoelectric film sensors for the application decubitus ulcers by determining effective calibration relationship between voltage and shear loading on the human skin.

EFFECT OF HARDNESS ON FRICTION AND WEAR CHARACTERISTICS OF OIL-BASED ZNO NANOFLUIDS

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Home Institution: University of Texas at Arlington, Georgia Institute of Technology
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:00 PM
Poster: 232
Mentor(s): J. David Schall (Oakland University: Mechanical Engineering), Qian Zou (Oakland University: Mechanical Engineering)

Nanofluids are fluids with a suspension of nanoparticles in base fluids. With a growing demand for efficiency and reliability, nanofluids with significant friction reduction and anti-wear properties have been studied extensively. Many different variables have been examined in order to find their effects on friction and wear performance of nanofluids. Those variables include: the surface roughness of a material, the size, shape, and concentration of nanoparticles, and the type of nanoparticles, base fluids and surfactants used. However, the effect of the hardness of a material on friction and wear when using nanofluids as lubricants has not been studied. In this project, pin-on-disk tests with carbon steels of varying hardness alongside ZnO-oil based nanofluids will be carried out to assess the effect of the hardness on friction and wear performance of nanofluids.

NUMERICAL MODELING OF TEMPERATURE RISE DURING BALL-ON-DISK TESTING AND SCUFFING

Caleb Messmer, Jonathan Glover
Home Institution: University of Evansville, Oakland University
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:00 PM
Poster: 233
Mentor(s): Laila Guessous (Oakland University: Mechanical Engineering)

Scuffing is an abrasive surface phenomenon occurring in tribosystems that leads to failure in mechanical and automotive components. The occurrence of scuffing is directly related to a dramatic rise in the coefficient of friction and in the surface temperature of contact surfaces due to the interaction of asperities between the two surfaces. One of the most common ways of studying scuffing is through the use of a ball-on-disk tribometer test. In this type of test, a load is applied to a stationary ball which is placed in contact with either a rotating or reciprocating workpiece and friction and wear are then monitored as the load is varied over time. In this study, we focus on numerically modeling the transient temperature rise that may occur during such a test. First, results from experimental testing are input into an elastohydrodynamic lubrication (EHL) model of an elastic solid in contact with a rigid adiabatic sphere is used to generate the pressure distribution in the contact area. Then a computational COMSOL heat transfer model that implements the reciprocating sliding motion of the test sample is used to simulate the transient temperature rise in the solid during ball-on-disk (BOD) experimental testing. The effects of various thermomechanical loads on both the bulk and flash temperatures of the solid are presented and discussed.

EXPERIMENTAL INVESTIGATION OF SCUFFING RESISTANCE OF ALUMINUM-SILICON ALLOYS
Measrainsey Meng, Jazmyne Claggett, Minsheng He, Marla Schueller
Home Institution: California State University Los Angeles, University of Wisconsin - Platteville, University of Maryland College Park, Oakland University
Category & Time: Mechanical Engineering, Section 2, 1:00 PM - 2:00 PM
Poster: 234
Mentor(s): Gary Barber (Oakland University: Mechanical Engineering), J David Schall (Oakland University: Mechanical Engineering), Qian Zou (Oakland University: Mechanical Engineering)

Aluminum-silicon alloys are increasingly being used in the automotive industry due to their light weight and ease of manufacturability. With their increasing usage, it is imperative that the scuffing behavior of aluminum-silicon alloys be studied, particularly under the high-speed reciprocating contact that is very common in automotive applications. Scuffing is one of the major failure mechanisms for automotive mechanical components. Understanding the causes of scuffing could assist in finding ways to prevent it and extend the life cycles of parts. This study examines the scuffing resistance of aluminum-silicon alloys under reciprocating conditions. The effects of different factors such as heat treatment, hardness, and microstructure, which can affect the scuffing performance of materials, were investigated. The results from this study should help shed some light on the scuffing behavior of this important class of materials.

COMPOSITE FAN CASE BLADE-OUT SCENARIO CONTAINMENT TESTING
Ryan Blancke, Mike Schwartz
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 3, 2:00 PM - 3:00 PM
Poster: 236
Mentor(s): Andy Vanderklok (Mechanical Engineering), Xinran Xiao (Mechanical Engineering)

Fans are used on commercial high bypass aircraft engines to provide thrust forces essential for flight. The fan is nested within a duct otherwise known as a fan case to direct the flow of air to make the engine more efficient. However this case serves the dual purpose of a duct and as a containment structure, necessary in the case of a fan blade out scenario. Several studies have been made on testing numerous metals for production in fan cases, but composites have not been tested as extensively. Composite materials are lightweight, strong, and have great potential to be used in aerospace applications. Composite's unique properties correlate with the optimal design mechanics in aerospace engineering, giving the strength of a metal hardwall case, and the lightweight of a softwall design. The kinetic energy of a released blade can be broken down into translational and rotational components. Individual pre-screening test using a ballistic gun test and a rotational energy test can represent a blade out contact with a fan case, without producing it on a full scale. High-speed cameras, strain gauges, thermo couples, and accelerometers are key transducers used to measure the dynamic event. From these tests and the data acquired, we have been working on how to limit the amount of damage the fan blades do to the case. Future analysis will be done on full-scale composite fan cases to confirm the credibility of composite fan case designs.

AN EXAMINATION OF LINEAR SHEAR FLOW AND ITS CONSEQUENCES ON THE FLOW FIELD IN THE WAKE OF A PITCHING AIRFOIL AT LOW REYNOLDS NUMBER
Harsh Patel
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 3, 2:00 PM - 3:00 PM
Poster: 237
Mentor(s): Manoochehr Koochesfahani (Mechanical Engineering), Ahmed Naguib (Mechanical Engineering), David Olson (Mechanical Engineering)

Birds and micro air vehicles (MAV) typically operate in urban environments with complex non-uniform flow fields. While previous research has focused primarily on studying these flyers in uniform flow fields, we are interested in studying these flyers in a linear shear flow as an idealized form of more realistic flow environments. A linear shear flow has a linear velocity variation over a given spatial region. This research is focused on experimentally creating and characterizing a linear shear flow and examining its consequences on the aerodynamics of a pitching airfoil at low Reynolds number, which represents a simplified model of the wing flapping. A recirculating water tunnel is used to generate a shear flow by placing a pressure-gradient-inducing device upstream of the pitching airfoil. Measurements rely on one-component molecular tagging velocimetry (MTV), an optical technique that relies on molecules that can be turned into long lifetime tracers upon excitation by photons. A pulsed laser is used to "tag" the regions of interest, and they are interrogated at two successive times within the lifetime of the tracer. The measured Lagrangian displacement vector provides an estimate of the fluid velocity. The pitching airfoil characteristics will be examined with regards to the formation and spatial arrangement of vortices in the wake of the airfoil as a function of time. We hope to document the differences between the baseline uniform case and that involving a linear shear flow in order to enhance our understanding of the aerodynamics of bird/MAV flight in a complex environment.

DESIGN AND PROCESSING OF MICRO GAS CHROMATOGRAPHY AND PERSPIRABLE SKIN
Aleksandr Vartanian
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 3, 2:00 PM - 3:00 PM
Poster: 238
Mentor(s): Patrick Kwon (Mechanical Engineering), Do Truong (Mechanical Engineering)

The basis of this research was to design and create a workable model for a component used in micro gas chromatography and to test and generate a unique model for perspirable skin. The objective of micro gas chromatography is to take inlet gas and analyze it in order to observe the minute chemicals present. The device of focus in the project used a hydrogen flame (combustion) to detect the chemicals within each gas by measuring the ions generated when the gas passed through the flame. The concentration of the ions could then indicate which chemicals were contained within each the gas. This device was created by milling a piece of graphite in the shape of the different gas pathways and placing it within a compressed alumina powder. Once this powder was compressed and sintered, the graphite burned out to create a hollow path and the power hardened into a ceramic. The objective of the perspirable skin was to create a small tile that would deform by buckling under intense heat. This model was created by utilizing materials with both positive and negative coefficients of thermal expansion (CTE). When heated, the combined tension and compression allowed the tile to buckle and the edges of the tile to rise. This component can be used for cooling high-temperature objects such as space shuttles upon re-entry. This component was created by utilizing a mill to cut the two materials with positive and negative CTE.

DESIGN AND MANUFACTURE OF QUAD-AXIAL Q3D WOVEN COMPOSITE

Yuchen Zhang
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 3, 2:00 PM - 3:00 PM
Poster: 239
Mentor(s): Dahsin Liu (Mechanical Engineering)

Due to the interlocking of fiber yarns in the three orthogonal directions, three-dimensional (3D) woven composites have been found to have higher resistance to out-of-plane loading. In order to keep the fibers as flat as possible to achieve high in-plane stiffness, the undulation of fiber yarns must be kept as small as possible. This leads to the design of a class of fiber composites called quasi-three-dimensional (Q3D) woven composite. This project is focused on designing and manufacturing a Q3D woven composite with four orientations and twelve interlocking layers, i.e. $[0/45/90/-45]_3$. The design starts with paper strips with four different colors (blue, white, red and yellow) to represent the four yarns of 0 deg, 45 deg, -45 deg and 90 deg. Once verified, glass fiber yarns will be used for making real fabrics. In comparison with the commonly used laminated (L) and two-dimensional woven (2DW) composites, both $[0/45/90/-45]_3$ and $[0/45/90/-45]_3$ fabrics, respectively, will also be prepared and infused with an epoxy resin to form corresponding composite materials. Low-velocity impact will then be used to demonstrate the superiority of the quasi-isotropic $Q3D[0/45/90/-45]_3$ composite.

A NUMERICAL INVESTIGATION OF LOCAL HEAT TRANSFER COEFFICIENTS ON THE UNDERSIDE OF AN OIL-JET COOLED PISTON

Jan Hellmich, Stephen Powell, Zachary Waldrup
Home Institution: University of South Alabama, Oakland University
Category & Time: Mechanical Engineering, Section 3, 2:00 PM - 3:00 PM
Poster: 240
Mentor(s): Laila Guessous (Oakland University: Mechanical Engineering), Brian Sangeorzan (Oakland University: Mechanical Engineering)

Driven by the demand for improvement in fuel economy, the average engine size has been progressively decreasing, and consequently the power-density of engines has been increasing to meet the engine power requirements. This increase in engine power-density has resulted in significant increases in the thermal loads on pistons, necessitating the use of oil jets to cool the pistons and avoid exceeding the pistons' metallurgical temperature limits. This investigation aims to numerically validate the local heat transfer coefficient on the underside of an engine piston due to an impinging oil jet. Boundary conditions, which were based on a previously conducted reference experiment, were applied to a thermal finite-element piston model. A commercial solver was used to perform a parametric study of the piston thermal boundary conditions and the oil jet heat transfer coefficient values. In a parallel study, a commercially available CFD package was also used to model the behavior of the oil jet striking the piston in the presence of an air environment, and to numerically determine the local heat transfer coefficient. Combined, these studies allow for the computational prediction of the heat transfer by the impinging oil jet and compared favorably with the experimental data.

THE DESIGN & CONSTRUCTION OF AN ANKLE TWISTER – THE FIXTURE

William Kang
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 4, 3:00 PM - 4:00 PM
Poster: 242
Mentor(s): Clifford Beckett (Radiology), Roger Haut (Radiology)

Ankle injuries are the most common sports injuries and can result in chronic ankle dysfunction. In order to prevent such injuries, researchers have used surrogate ankles to study the effects of shoes and surfaces on torque and motion of the ankle. The purpose of the current study was to design a fixture that will rotate a surrogate ankle along three directional axes: internal/external rotation, plantar/dorsiflexion, and inversion/eversion. The surrogate ankle will be a left limb consisting of a lower leg and a size 11 foot/ankle. A Material Testing Systems (MTS) servo-hydraulic testing machine will apply axial loading to the lower leg while the foot is mounted onto the fixture, which will allow three-dimensional motion of the surrogate ankle. Two actuators will be mounted horizontally into the fixture: one to apply inversion/eversion and another to apply plantar flexion/dorsiflexion. A third actuator will mount vertically underneath the fixture to apply internal/external rotation to the ankle. The surrogate ankle in various shoe designs will be subjected to multiple loading scenarios. The ideal range of fixture motion will be to move from a plantar flexion of 60° to a dorsiflexion of 30°,

an internal rotation of 90° to an external rotation of 90°, and an inversion of 80° to an eversion of 30°. The completion of this fixture will aid in the development of footwear that can provide ankle support and enough flexibility to prevent serious injuries to the ankle in workplace and sporting situations.

ANALYSIS OF A TURBULENT JET IGNITION SYSTEM IN A RAPID COMPRESSION MACHINE

Tong Wu
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 4, 3:00 PM - 4:00 PM
Poster: 243
Mentor(s): Gerald Gentz (Engineering), Elisa Toulson (Engineering)

Increasing demand for fossil fuels and low emissions bring challenges to the design of internal combustion engines. Turbulent jet ignition is a pre-chamber ignition system for standard gasoline fueled engines that involves the use of a chemically active turbulent jet to initiate combustion in lean fuel mixtures. With turbulent jet ignition the mixture burns rapidly and with low combustion variability, which allows for low hydrocarbon emissions and almost zero NOx, due to lower peak temperatures. Rapid Compression Machines are a popular way to study combustion in a constant volume closed chamber with various adjustable conditions. In addition the MSU Rapid Compression Machine enables optical access of the combustion process. For this project, the Rapid Compression Machine will compress a pre-charged air fuel mixture and a turbulent jet igniter mounted in the combustion chamber of the rapid compression machine will ignite the compressed air-fuel mixture. A high speed camera will then record the combustion process for further analysis of effectiveness of combustion. An optional optical band pass filter could be used with the camera lens for chemiluminescence analysis. These results can be used to gain further understanding of how the turbulent jet ignition process can be used to improve combustion efficiency in internal combustion engines.

EXPLORING A NEW METHOD FOR AORTIC WALL THICKNESS MEASUREMENTS IN COMPUTED TOMOGRAPHY IMAGES

Bara Aldasouqi
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 4, 3:00 PM - 4:00 PM
Poster: 244
Mentor(s): Seungik Baek (Mechanical Engineering)

Abdominal Aortic Aneurysm (AAA) is a leading cause of death in the elderly population. Computed Tomography (CT) scans are used to diagnose AAA and to help physicians make treatment decisions. Biomechanical research utilizes patient-specific aneurysm geometry acquired through CT images to better understand the disease. Such research allows for more accurate predictions of aneurysm growth and risk of rupture. A method to measure aortic wall thickness from CT images will make biomechanical analysis more accurate and may allow clinicians to better assess rupture risk. This task is challenging due to the limited resolution of CT images. This work primarily seeks to explore the feasibility of wall thickness measurements based on the radiodensity profile along lines traversing the aortic wall. The goal is to complement existing techniques by (1) exploring the directly observable features of CT images, (2) seeking to understand whether and under what conditions CT imaging truly does capture the AAA wall, and (3) studying how patient-specific wall thickness varies in the presently available dataset of approximately 60 CT scans.

BIOMECHANICALLY RELEVANT ESTIMATION OF COMPLETE GROUND REACTION FORCES IN WALKING USING PLANTAR PRESSURE INSOLES

Benjamin Carruthers
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 4, 3:00 PM - 4:00 PM
Poster: 245
Mentor(s): Jerrod Braman (Radiology), Roger Haut (Radiology), Feng Wei (Radiology)

In vivo biomechanical analysis has been used as an effective tool to document motions. Yet, analysis has been typically restricted to laboratory settings with embedded force plates. Pressure insoles have also been used as a biomechanical analysis tool and have the benefit of portability. However, the insoles inherently only measure the vertical ground reaction force (GRF). Previous studies have used linear regression and other numerical methods to estimate the complete set of GRFs during gait using pressure insole technology, but these models have not used any biomechanical relevance in the determination of which sensors to use for the analyses. It was hypothesized that a more accurate model may be developed if the gait cycle were broken up into stages. The study collected plantar pressure and GRF data during walking using in-shoe pressure insoles and a force plate, respectively. Gait cycles were synchronized using the vertical force outputs and then split into two stages separated by the mid-stance phase. Pressure sensor masks (PSMs) were formed for each stage using data from specific pressure sensors spatially located on the insoles that had high linear correlation with the force plate-measured anterior/posterior and medial/lateral GRFs. Linear regression analyses were utilized to develop the anterior/posterior and medial/lateral force models from the PSMs. The vertical force component was calculated from the sum of the forces from all sensors. These models are expected to yield accurate, complete GRF data that can be used in biomechanical analyses without the need for a laboratory with an embedded force plate.

COMPARISON OF THE MECHANICAL PERFORMANCE OF 3D PRINTED VS. MACHINED OBJECTS

Tyler Patrick
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 5, 3:00 PM - 4:00 PM
Poster: 247
Mentor(s): Guojing Li (Mechanical Engineering), Dahsin Liu (Mechanical Engineering)

Additive manufacturing, more widely known as 3D printing, has become a rapidly growing industry in the last decade or so, largely used in its applications of rapid prototyping. This research focuses on the accuracy and difference in mechanical performance of additive manufacturing as opposed to the more commonly used process of subtractive manufacturing, or machining. The primary process studied is called direct metal laser sintering (DMLS). A design for an instrumented projectile with a very specific microstructure was used to verify the dynamic strain measurements of DMLS printed objects composed of both aluminum and maraging steel. The readings from both a drop-weight test and a gas propelled projectile test on a split Hopkinson pressure bar were used as validation for this experiment; the closer match of the force waveform to that of the machined projectile, the more similar the microstructures.

PRODUCTION OF SILICON NANOCRYSTALS IN A GAS-PHASE PLASMA REACTOR

Michael Bigelow, Reema Al Dhaneem
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 5, 3:00 PM - 4:00 PM
Poster: 248
Mentor(s): Rebecca Anthony (Mechanical Engineering)

Silicon nanocrystals (NCs) act as a semiconductor and can be used in a variety of applications including light emitting diodes (LEDs), photovoltaic cells, and, if made water soluble, biological imaging techniques. The method of creation of these NCs has, up to recently, been dominated by liquid-phase synthesis. A faster, more efficient method to procure these NCs while minimizing the risk of sample contamination is in a gas-phase, non-thermal plasma using argon and silane gases. Here, the creation of the plasma reactor will be discussed. The samples collected in the plasma reactor were tested for crystallinity using X-Ray diffraction, surface analysis using Fourier Transform Infrared Spectroscopy (FTIR), film morphology using a Scanning Electron Microscope (SEM). For the sake of LEDs – the main purpose of the produced samples – the most important of these qualities is photoluminescence (PL), the ability of a material to emit light after excitation through contact with photons. The input parameters of the plasma reactor - forward power to the reactor, flow rates of silane and argon, and the pressure inside the reactor - were modified for each sample. The calibrations on the reactor necessary to facilitate the production of high PL samples is included here.

METAL COATED NANOSPHERE DOUBLE DETACHMENT TRANSFER TO SUBSTRATES

Jongwon Kim
Home Institution: Michigan State University and Dongguk University
Category & Time: Mechanical Engineering, Section 5, 3:00 PM - 4:00 PM
Poster: 249
Mentor(s): Junghoon Yeom (Mechanical Engineering)

Ordered submicron- and nanostructures on substrates have attracted tremendous interest due to their unique physical properties and potential novel applications in areas such as optoelectronics, sensing, and high-density storage devices. Scalable and inexpensive methods to fabricate these structures with tunable dimensions and properties are therefore important in realizing this potential, and nanosphere lithography is one of the most popular nanopatterning techniques due to its simplicity. Polymer nanospheres are self-assembled onto a substrate to form a two dimensional close-packed hexagonal array, and reactive ion etching is often used to separate the nanospheres by reducing their size. Then a thin metal film is deposited onto the substrate with an array of nanospheres as a masking layer, and after lift-off, a metal mesh film with submicron- or nanometer-scale holes is produced. In a different setting, polymer nanospheres can serve as an etch mask for etching the underlying substrate, but the nanospheres are vulnerable to plasma etchants limiting the shape and dimension of the resulting nanostructures. Here we present a generic method to form a masking layer of metal-coated nanospheres on, essentially, any substrates, and this feat will be achieved by double transfer method developed in our laboratory. An array of the metal-capped nanospheres can now serve as the resilient etch mask for fabricating nanostructures of various materials including quartz. In addition, this process may help to create some interesting plasmonic structures that may be difficult to be fabricated otherwise.

FRACTURE INITIATION IN THE ADULT PARIETAL: A RE-TESTING OF THE MECHANISM OF SKULL FRACTURE

Patrick Vaughan
Home Institution: Michigan State University
Category & Time: Mechanical Engineering, Section 5, 3:00 PM - 4:00 PM
Poster: 250
Mentor(s): Todd Fenton (Anthropology), Roger Haut (Osteopathic Medicine)

Pediatric head injury is a leading cause of death in infants of less than 2 years. With most head injury cases involving skull fracture, it is currently impossible to distinguish between abusive or accidental causalities based on these fractures. Currently, abuse is characterized by the presence of multiple skull fractures, suggesting multiple points of impact(POI). However, early experimental studies on adult heads by Gurdjian et al. and pediatric heads by Weber suggest that blunt forces can generate multiple, peripherally-initiated cranial fractures due to outbending. However, a recent forensic study with adult heads produced linear skull fractures originating from the POI, putting the earlier works into question. While not explicitly stated in the recent forensic study, a photograph appeared to show a relatively small-sized flat impacter. Based on the early work of Gurdjian et al., this might indeed suggest the generation of a locally depressed skull fracture with linear fractures radiating outwards from the POI. The current project was designed to address the issue of cranial fracture initiation and propagation during blunt impact. The hypothesis was that cranial impact over a relatively large area will generate linear fractures periphery to the POI, while impacts over small contact areas will generate depressed skull fractures with radial fractures emanating from the POI. High speed photography confirmed that the initiation and propagation of cranial fractures depends on impacter size. Furthermore, computational modeling confirmed that the patterns of cranial fracture are based on large tensile stresses, which are developed in the skull during impact.

PHYSICAL & MATHEMATICAL SCIENCES

CHEMICALLY MODIFYING THE SURFACE CHEMISTRY OF TWO TYPES OF CARBON ELECTRODE "GLASSY CARBON" AND "BORON DOPED DIAMOND"

Azeez Ibrahim
Home Institution: Medgar Evers College
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 252
Mentor(s): Greg Swain (Chemistry)

The objective of this research project is to investigate whether the surface of these carbon electrodes can be chemically modified and, if so, what effect does the change in surface chemistry have on the electron transfer rates of a soluble redox system. Three surface terminations will be studied: hydrogen-terminated, oxygen-terminated and amine-terminated. The hydrogen-terminated surfaces will be introduced via microwave plasma in the presence of hydrogen, while the oxygen and amine-terminated surfaces will be produced in a radio frequency plasma using oxygen and ammonia, respectively. Once the surface chemistry of the electrode has been changed, the question pertaining to the effect the change has on some basic electrical chemical properties of the electrode arises. In order to answer this question and satisfy the objective of this research, cyclic voltammetry (CV) will be used to investigate the background current and Faradaic current response for two soluble redox systems: $Fe(CN)_6^{-3/-4}$ and $Ru(NH_3)_6^{+3/+2}$. For both electrodes, the hydrogen-terminated surfaces should exhibit high activity for both redox systems. For the oxygen-terminated surfaces, we expect high activity for $Ru(NH_3)_6^{+3/+2}$ and more inhibitory effects on $Fe(CN)_6^{-3/-4}$. The activity of the amine-terminated surfaces will depend on the solution pH. With the amine groups protonated (positive surface charge), high activity is expected for $Fe(CN)_6^{-3/-4}$ while more inhibited electron transfer is expected for $Ru(NH_3)_6^{+3/+2}$. The significance of this research is that it provides a greater understanding of modified electrodes. Such modification could serve as a foundation for electrochemical detection schemes of enzymes, proteins, and DNA.

FRAGMENT YIELD CORRECTIONS IN TIN-TIN COLLISIONS

Chun Yuen Tsang
Home Institution: The Chinese University of Hong Kong
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 253
Mentor(s): Man-Yee B Tsang (National Superconducting Cyclotron Lab)

In nuclear collisions that occur at the NSCL and FRIB, many different species of nuclei are produced. Most of these nuclei are stripped of all the electrons but some still have electrons attached. Nuclei with electrons attached will be misidentified in a mass spectrometer and contaminate the other fragments. In my research, we compare the yields of fragments produced in the collisions of different Sn isotopes (112Sn, 118Sn and 124Sn) which have same number of protons (50) but different number of neutrons. Such measurements help us to study the differences in the interactions of neutrons and protons, which is important in our understanding of very neutron rich objects such as the neutron stars. The S800 mass spectrograph is used to identify different fragments produced in these Sn reactions traveling at approximately 40% speed of light. We use LISE, a widely used program in nuclear physics, to calculate how fragments with different charges are distributed. It predicts that the hydrogen-like fragments contaminate mainly the yields of isotopes with two extra neutrons. We use the algorithm GLOBAL, also embedded in LISE, to calculate initial estimates of the contamination fractions of each fragment. Then we develop an iteration procedure to extract the yields of the hydrogen-like fragments (the main contaminants) and to obtain the correct yields of the fragments we want to measure. In this poster, I will present how these corrections are done and the physics results we obtain.

MINIMIZING RESIDUAL PRESSURE WITHIN A WINDOWLESS GAS TARGET SYSTEM - JENSA

Orlando Gomez
Home Institution: Florida International University
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 254
Mentor(s): Justin Browne (Physics & Astronomy), Antonios Kontos (National Superconducting Cyclotron Laboratory), Fernando Montes (National Superconducting Cyclotron Laboratory)

Background: Jet Experiments in Nuclear Structure and Astrophysics (JENSA), located at the National Superconducting Cyclotron Laboratory, is an experimental device capable of providing a windowless, dense (~10^{19} atoms/cm^2), jet gas target. Nuclear reactions between light gases and radioactive isotope beams are essential to address active research in nuclear structure and astrophysics. Pure gas targets such as helium and hydrogen are critical for measurements of proton--alpha--induced mechanics. Even though the gas flow is localized, escaping residual gas creates a pressure gradient which degrades experimental data and contaminates the beam line. JENSA contains a differential pumping system to maintain a vacuum. However, current design configuration is not optimized (currently measuring ~10^{-3} Torr 70 cm downstream from jet; optimal is 10^{-4} Torr or as low as possible). We propose to alter the current configuration of the differential pumping system to minimize the residual pressure within JENSA. Methods: Apertures and gas receiving components will be modified. Turbomolecular pumps will be rerouted into alternative configurations. Enhanced Pirani and Cold Cathode gauges will be used to comparatively measure the residual pressure of each configuration to a modeled simulation to find a minimum. Results: We expect that altering the current configuration will lower residual pressure within JENSA below 10^{-4} Torr 70 cm downstream from the jet. Conclusion: Minimizing the residual pressure allows operation of JENSA with minimal contamination and data degradation. The JENSA windowless gas target system will host the next generation of radioactive beam experiments. Funding: NSF Grant No. PHY08-22648

MODELING INTERACTIONS BETWEEN VARIOUS CELL POPULATIONS IN A CANCEROUS SYSTEM
Cheyenne Peters, Aaron Crump, Jamilla Johnson, Asia Youngblood
Home Institution: Michigan State University, Wayne State University
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 255
Mentor(s): Mark Iwen (Math & ECE), Hyejin Kim (University of Michigan Dearborn: Math), Tsvetanka Sendova (Math)

We create two ordinary differential equations (ODEs) models to study how normal, benign, metastatic, and immune cell populations evolve in a patient with cancer. The first one-patch model deals with the cell populations in one area. Using a stability analysis for this model, we determine a healthy equilibrium point with no tumor cells and analyze what conditions it is stable under. This model is also used to show the effects of immunotherapy on a cancerous system. The second two-patch model looks at the cell populations in two different areas of the body. A healthy equilibrium is also found for this model.

EXPLORING NEW ADDITIVES FOR PALLADIUM CATALYZED PMHS REDUCTIONS OF HALOGENATED ARYL BORONATES
Monique Noel, Jack Warsh
Home Institution: Florida Agricultural and Mechanical University, Michigan State University
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 256
Mentor(s): Chathurika Jayasundara (Chemistry), Robert Maleczka (Chemistry)

Aryl boronates are key building blocks for the construction of drug candidates, agrochemicals, organic LEDs, and other important compounds. Over the past 10 years Ir-catalyzed C-H borylation have emerged as a green process in which these boronates have been synthesized. Despite their wide use, Ir-catalyzed borylations can lack regioselectivity when performed on fluoroarenes. Our group recently developed a two step process that positions the boronate ortho to fluorine. This method uses a halogen as a steric blocking group to achieve selectivity. Removal of the halogen was first accomplished by Pd-catalyzed hydrodehalogenation using KF activated polymethylhydrosiloxane (PMHS). However KF has the potential to form HF, which is hazardous, destructive to glass line reactors, and cam promote deborylation of the desired product. In order to avoid these problems, different activators of PMHS have been investigated. The results of these studies are presented herein.

CSI(TL) CRYSTALS FOR CHARGED PARTICLE DETECTION
Corinne Anderson
Home Institution: Michigan State University
Category & Time: Physical and Mathematical Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 257
Mentor(s): William Lynch (Physics), Betty Tsang (Physics)

The energies of nuclear particles emitted during a nuclear reaction are among the most important quantities to measure experimentally. For many experiments, these particles would be neutrons, protons and light atomic nuclei. Except for neutrons, these particles have non-zero charges, which will interact via the Coulomb force with the electrons in detectors. Energies of these charged particles can be measured by counting the electrons that are ionized by the particle when they pass through detectors or by measuring the light that accompanies this ionization. CsI(Tl) crystals emit light abundantly when charged particles pass through them, and the amount of light is proportional to energy. Energies of charged particles detected in CsI(Tl) crystals are determined by measuring this light. This poster discusses how the crystals are made and fabricated into detectors, provides some results using these crystals to detect particles and discusses how these crystals are combined into arrays and used to study nuclear reactions.

AQUEOUS ALTERATION OF PRESQUE ISLE PERIDOTITE IN MARQUETTE, MICHIGAN
Luis B. Martinetti
Home Institution: The University of Texas at El Paso
Category & Time: Physical and Mathematical Sciences, Section 2, 2:00 PM - 3:00 PM
Poster: 259
Mentor(s): Michael Velbel (Geology)

The specific nature of the aqueous alteration phenomena that have affected an ultramafic body, the Presque Isle serpentinized peridotite, on Marquette, Michigan, has yet not been solved. Previous work debated whether the observed alteration phenomena is a product of weathering during the Precambrian, creating soils which were preserved by deposition of sandstone overlaying the altered peridotite, or the alteration was caused by hydrothermal fluids coming from a nearby dolomite-quartz dike, altering the peridotite. The published mineralogy and chemical analyses of the Presque Isle peridotite were compared to a Ni-Laterite weathering profile on similar parent rock in the Kalgoorlie area of Western Australia. Major element ratios, the type of product created due to the alteration, and the mineralogy, from unaltered rock and altered rock in different states of alteration on Presque Isle were compared to those of the Kalgoorlie area. Major element ratios were determined and the depth profiles of the element ratios were plotted for both locations. The comparison of depth profiles from both locations showed many differences in the trends and few similarities. The trends in depth profiles for most indices from Presque Isle's data differ from a Ni-Laterite weathering profile. The dissimilarity between element-ratio profiles at Presque Isle and those at Kalgoorlie suggest that the elemental distribution with depth are not consistent with a Ni-laterite weathering origin of peridotite alteration at Presque Isle.

SEPARATION OF LANTHANIDES FROM MONOVALENT CATIONS VIA ELECTRODIALYSIS THROUGH POLYELECTROLYTE MULTILAYER-MODIFIED MEMBRANES

Elena Alemayehu
Home Institution: Michigan State University
Category & Time: Physical and Mathematical Sciences, Section 2, 2:00 PM - 3:00 PM
Poster: 260
Mentor(s): Nicholas White (Chemistry), Merlin Bruening (Chemistry)

In electrodialysis, electrical potentials drive cations or anions through a membrane between a source and receiving cell. We aim to separate lanthanides from monovalent cations with high selectivity using electrodialysis through polyelectrolyte multilayer-modified membranes. A Commercial nanofiltration membrane showed a K^+/La^{3+} electrodialysis selectivity of 16; however, modifying this membrane with 5 poly(4-styreneesulfonate)/ protonated poly(allylamine) bilayers increased this selectivity to >1000. Previous work with the same membranes gave a K^+/Mg^{2+} selectivity around 100. The high K^+/ La^{3+} electrodialysis selectivity relative to K^+/Mg^{2+} is due in part to the high charge of La^{3+}. The greater positive leads to more repulsion by the protonated poly(allylamine) layer on the modified membrane. The K^+ transference number , the fraction of current carried through the membrane by K^+ ions, however; was ~.35 for K^+/Mg^{2+} but only ~.23 for the K^+/La^{3+} separation. The La^{3+} and the Mg^{2+} transference number are both ~0. This means that most of the electrical potential is not being used to drive the desired ion (K^+) across the membrane. Future work aims to increase the K^+ transference numbers as well as examination of other Lanthanides.

OPTIMIZATION OF THE EFFICIENCY OF A NEUTRON DETECTOR TO MEASURE (α,N) REACTION PROBABILITY

Jesus Perello
Home Institution: Florida International University
Category & Time: Physical and Mathematical Sciences, Section 2, 2:00 PM - 3:00 PM
Poster: 261
Mentor(s): Fernando Montes (National Superconducting Cyclotron Laboratory)

Nucleosynthesis, the origin of elements, is one of the greatest mysteries in physics. A particular nucleosynthesis site of interest is the charge-particle process (cpp). In cpp, elements form by fusion reactions during supernovae. At the moment, this fusion site is not understood and has been proposed to be studied. This process of fusion, (α,n), will be studied by colliding beam elements produced and accelerated at NSCL to a helium-filled cell. The elements will fuse with α (helium nuclei) and emit a neutron. These neutrons will be detected, giving us a count of fused-elements, thus giving us the probability of such reactions. By knowing the probability, we can then calculate how much of a certain element will be created in cpp which tells us its abundance. The neutrons will be detected using the Neutron Emission Ratio Observer (NERO). Right now, NERO's efficiency varies for neutrons at the expected energy range. To study (α,n), NERO's efficiency must be near-constant at these energies. MCNP6, a software package which simulates nuclear processes, will be used to optimize NERO. MCNP6 will be used to simulate neutron interaction with different NERO geometries at the expected neutron energies. It's anticipated that by adding detectors and polyethylene, NERO can obtain a near-constant efficiency at the expected energies. By obtaining a NERO with near-constant efficiency, study of the (α,n) reactions can begin, which may explain how elements are formed. By providing a missing piece to the understanding of element formation, we move one step closer to understanding the cosmos.

BUILDING A FISSION DETECTOR

Jorge Maciel Martins
Home Institution: Michigan State University
Category & Time: Physical and Mathematical Sciences, Section 2, 2:00 PM - 3:00 PM
Poster: 262
Mentor(s): Zachary Kohley (Chemistry, National Superconducting Cyclotron Laboratory)

A new detector system for fission reactions will be constructed at the National Superconducting Cyclotron Laboratory. The present study examines how the variation of some parameters of the detector such as thickness, time resolution and position resolution affects the Sigma of the Gaussian Equation that fits the number of events that are caught by the detectors using a computer simulation. The efficiency of the reaction also can be predicted by the simulation. The results can be used to as a starting point to build the detector with the best configuration.

COMPARISON OF PHOTOLUMINESCENCE AND REFLECTANCE SPECTRA FROM SINGLE LAYER WSE_2 CRYSTALS

Kevin Jock
Home Institution: Michigan State University
Category & Time: Physical and Mathematical Sciences, Section 2, 2:00 PM - 3:00 PM
Poster: 263
Mentor(s): Athos Petrou (University at Buffalo: Physics)

Photoluminescence (PL) and reflectance spectroscopy are used to characterize the exciton in Tungsten Diselenide (WSe_2) monolayers. Through photo-excitation, an electron is excited from the valence band to the conduction band leaving behind a hole. A PL study aims to identify the electron-hole pair (exciton) as positive, neutral, or negative. The WSe_2 sample was placed on a sample holder in the center of a continuous flow optical cryostat that is operated in the 5-300 Kelvin temperature range. A PL spectrum completed at 5K had a highest energy feature at 1.750 eV. This feature is associated with a (free) neutral exciton. The PL feature at 1.750 eV is compared with the reflectance spectrum where a single spectral line is seen at 1.750 eV. The presence of this reflectance feature indicates the exciton is free (not bound).

SOCIAL, BEHAVIORAL, & ECONOMIC SCIENCES

THE RELATIONSHIP BETWEEN AGGRESSION AND SUBMISSION IN SPOTTED HYENAS

Aliyah Glover
Home Institution: University of Arkansas at Pine Bluff
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 265
Mentor(s): Eli Strauss (Zoology)

Agonistic behavior amongst spotted hyenas (Crocuta crocuta) can be classified as aggression or submission. Aggression is behavior intent on damaging another individual while Submission marks subordinate status relative to a dominant individual and serves to diffuse escalated aggression. It is unclear if these two forms of agonistic behavior are opposite ends of a single continuum or if they are two independent behaviors. This research investigates the relationship between these two behaviors in individual spotted hyenas. The data was collected from a population of spotted hyenas in the Talek region of the Masai Mara National Reserve in southern Kenya between the hours of 6:00 am to 9:00 am and 5:00 pm to 8:00 pm during the years 2001, 2002, 2005, and 2006. Data was recorded using Microsoft Access and R-Studio software used to create a rank matrix and analyze data via a Chi-squared analysis. If the rate of aggression highly predicts the rate of submission, it supports the hypothesis that these two behaviors are on the two ends of the same scale. If not, it suggests that the variables are on two independent scales. We anticipate that rate of aggression is correlated with the rate of submission, suggesting that these two behaviors represent opposite end points on a single continuum. Our research will allow us to describe social stratification and the forces that promote and tame it.

MANAGERIAL ACCOUNTING SKILLS REQUIRED OF GENERAL MANAGERS

Yunwei Zhang
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 267
Mentor(s): MiRan Kim (Hospitality Business)

Club general managers are in charge of making key decisions for the property he/she manages, besides knowing the physical property well, it is also required to know the property's financial status, so the managerial accounting skills also plays an important role. What managerial accounting skills are essential to club general managers? This study uses online survey research to examine the importance of a selected list of managerial accounting skills and their importance to club managers. In this study, club controllers will be asked to rank the importance of a selected group of managerial accounting skills to club general managers. Then the clubs will be classified in different groups by type, size, location, and the results will be compared within and between the groups. In order to conduct this study, online survey will be conducted to members of the Hospitality Financial and Technology Professionals. The survey contains two parts of questionnaires, first part will be demographic items of the respondents, and the second part will be the list of managerial accounting skills that are important to club general managers. . This study will provide useful information in designing the curriculum in certain managerial accounting courses. It will also be useful to accounting and management professionals.

BELIEVERS UNDER DIFFERENT FLAGS: DISCRIMINATION AGAINST RELIGIOUS MINORITIES IN PREDOMINANTLY ORTHODOX STATES

Tatiana Rosario
Home Institution: Beloit College
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 268
Mentor(s): Ani Sarkissian (Political Science)

There are approximately 225-300 million believers of Orthodox Christianity. Although the Orthodox Church is most dominant in Eastern Europe, it is also a significant minority in Ethiopia, Egypt, Syria, Lebanon and other former Soviet Republics. Predominantly Orthodox states, unlike predominantly Catholic and Protestant countries, have an intrinsically nationalistic quality in that their churches are divided by ethnic lines each with their own jurisdiction and unique beliefs. According to Jonathan Fox's book, A World Survey of Religion and State, predominantly Orthodox countries have the highest levels of discrimination against religious minorities (second only to predominantly Muslim states). In the Christian World, why do predominantly orthodox states have the highest levels of discrimination against religious minorities? For this project, I will use mixed methods analysis to explore why predominantly Orthodox states have the highest levels of religious discrimination in the Christian world. First, I will run correlation and regression analysis that will compare predominantly Orthodox states to the rest of the world in discrimination against religious minorities. I will combine this with case studies of predominantly Orthodox states with the highest levels and lowest levels of religious discrimination (Belarus and Ukraine). I hypothesize that government censorship legislation will explain why Orthodox countries discriminate against minorities at higher levels than other Christian countries.

SPASMODIC DYSPHONIA

Stephen Alfa
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 269
Mentor(s): Eric Hunter (Communication Arts)

Spasmodic dysphonia is a voice disorder characterized by involuntary movements or spasms of one or more muscles of the larynx during speech. There are three types of spasmodic dysphonia. The first one is called adductor spasmodic dysphonia. In adductor spasmodic dysphonia sudden involuntary muscle movements cause the vocal folds to slam together. This makes it difficult for vocal cords to vibrate and produce voice. People's voices are described as strangled and full of effort. Spasms are surprisingly absent while laughing, speaking at a high pitch, or speaking will singing. The second type of spasmodic dysphonia is called abductor dysphonia. In abductor spasmodic dysphonia sudden involuntary muscle movements or spasms cause the vocal folds to open. The open position of vocal folds allows air to escape from the lungs during while speaking. People's voices are described as weak, quiet, breathy or whispery. Just like in adductor spasmodic dysphonia, spasms are absent during activities such as laughing or singing. The third one is mixed spasmodic dysphonia. In mixed spasmodic dysphonia basically has features of both adductor and abductor spasmodic dysphonia. One very common treatment for spasmodic dysphonia is using botox. Botox improves some symptoms of spasmodic dysphonia. It is generally preferred because it has a low chance of long term side effects.

UNDERSTANDING EXPECTATIONS OF ONLINE COMMUNITIES

Stephanie Pena
Home Institution: University of Michigan
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 270
Mentor(s): Richard Wash (Journalism)

Online communities consist of large groups of people that aggregate online to work, socialize and communicate at a tremendous scale that would not be possible without the use of the internet. In these communities, like Facebook, Wikipedia and Reddit, potential users develop expectations and weigh the benefits of their participation. Through our research study, we aim to develop a better understanding of why and how people choose to participate in online communities. Our research goal is to further understand the expectations people form as they are introduced to new online communities. We administered qualitative interviews in which 50 subjects were exposed to Reddit or Quora for the first time. We questioned the subjects on any previous knowledge of the online community, had subjects complete a 'think-aloud' as they visited the community, and questioned subjects on their future expected participation in the community. Interview transcripts were then transcribed, cleaned, and coded. Since our research project is in its first year of operation, we are still in the process of analyzing the qualitative data we have collected.

THE UGLY SIDE OF SCHOOL CLOSURES: THE EFFECTS OF SCHOOL CLOSURES ON DETROIT'S NEIGHBORHOODS

Kenneth Rankins
Home Institution: McDaniel College
Category & Time: Social, Behavioral, and Economic Sciences, Section 1, 1:00 PM - 2:00 PM
Poster: 271
Mentor(s): Sarah Reckhow (Political Science), Laura Reese (Political Science)

The purpose of this research is to discover the impacts of school closures in Detroit on high poverty rate zip codes. School closures (and school openings) are the dependent variables. So we are looking at factors (like poverty, population loss) that might contribute to higher numbers of school closure. And examining whether closure of public schools contributes to opening of charter schools. For this project, we will be focusing on school closures and openings in Detroit from 1989 through 2014. During this time period, there have been almost 400 school closures, while there have only been 200 school openings. We identity which sections of the city are more likely to have closings and less likely to have new schools opening. Contrary to prior research showing that charter schools avoid locating in high poverty zip codes, Detroit's charter schools are opening in those areas. By exploring this issue, we can better categorize the types of schools opening in Detroit based on racial backgrounds and income levels by zip code. This research uses data from the Center for Educational Performance & Information and the U.S Census, articles commenting on the subject of school closings, and articles relevant to charter school openings. Upon examining all of this information, this research will provide valuable information on which types of schools are more likely to open in Detroit and which zip codes are being negatively impacted by school closures.

THE INFLUENCE OF HAIRSTYLE ON THE EVALUATIONS OF AFRICAN AMERICAN FEMALE JOB CANDIDATES

Courtney Bryant
Home Institution: Tuskegee University
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 273
Mentor(s): Christine Kemond (Psychology), Ann Marie Ryan (Psychology)

Drawing on social categorization theory, people make their interpretations of unconventional hairstyles based on their in-group. This can have a disproportionate effect on African American women as a double minority in the workplace, by race and gender. The purpose of this study is to investigate how hairstyle will influence evaluations of African American female job candidates for a leadership position. We hypothesized that African- American female job candidates with "natural" hairstyles (e.g. kinky curl pattern, braids, and dreadlocks) will be rated less favorably than African American or Caucasian female candidates with straight hair. It is also predicted that evaluations will be moderated by agentic or communal job descriptions, such that applicants with natural hairstyles will be more favorable for the agentic description. The variables will be manipulated by altering the hairstyles of the person in a LinkedIn profile and the job description as agentic or communal. The research design will utilize a questionnaire that will be administered through Amazon's Mechanical Turk and analyzed using SPSS. Based on literature with similar questions, (Karl, McIntyre Hall, & Peluchette 2013; Livingston, Rosette & Washington, 2012) we expect to find that African American candidates will be rated less favorably overall. The findings of this study will contribute to the literature regarding ethical and conscious hiring processes. It will also educate the public about how certain policies may disproportionately effect a population based on their ethnicity.

THE CONSEQUENCE OF CAPITAL PUNISHMENT ON MURDER SUPPLY DETERRENCE
James Gamble
Home Institution: University of Missouri-Columbia
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 274
Mentor(s): Jeffrey Wooldridge (Economics)

The efficacy of capital punishment is highly contested. The United State's penal system carries out more executions per year than any other developed nation, citing murder supply deterrence as validation for the preservation of the death penalty. Our findings offer significant statistical evidence to abet policymakers in crafting laws incentivizing murder supply deterrence. Using crime data collected by the FBI's *Uniform Crime Report (UCR)* and a unique data set on executions compiled by the Death Penalty Information Center (www.deathpenalty.org), we use county-level panel data to estimate a murder supply function, of the kind estimated in *Dezhbakhsh & Rubin, (2003)*. Unlike previous authors, we use county-level data to exploit variation of capital punishment within as well as across states. The panel data nature of the data allows us to control for systematic differences that would otherwise lead to endogeneity bias. Our panel data set also extends the data to the most recent year possible, enhancing efficiency by accounting for all of the relevant data.

COMPARISON BETWEEN LATINO MEN'S NARRATION OF ABUSE AND A CONCEPTUAL FRAMEWORK FOR SUCCESSFUL BATTERER INTERVENTION APPROACHES
Christian J. Murillo
Home Institution: California State Polytechnic University, Pomona
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 275
Mentor(s): Jose Ruben Parra-Cardona (Human Development and Family Studies), Cris Sullivan (Ecological-Community Psychology)

This study is built on an initial research investigation where there were 21 qualitative interviews conducted of Latino immigrant men who took part in Raices Nuevas, a Spanish version of the Duluth batterer intervention curriculum. There were important findings suggesting that a culturally informed batterer intervention program was indeed beneficial in addressing these men's abusive behaviors. However, supplementary research was needed to describe the batterer's narrative of their abuse. In this investigation, a further in-depth look at such narratives is conducted. Through qualitative research, comparisons are made between men who had recently started the program as opposed to men who were close to ending the program when describing their levels of accountability versus their description of the intervention program. Through thematic analysis, these narratives are then compared with a conceptual framework developed by Dr. J. Ruben Parra-Cardona and funded by the National Resource Center on Domestic Violence. The conceptual framework identifies important factors that compose successful batterer intervention approaches. Results of this study will provide preliminary findings that suggest whether the Raices Nuevas intervention model lends evidence that the conceptual model is valid.

TRACKING IN PREDOMINANTLY MINORITY SCHOOLS: EXPERIENCES OF HIGH-ACHIEVING MINORITY STUDENTS
Stephanie Mayo
Home Institution: Beloit College
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 276
Mentor(s): Terah Venzant-Chambers (Educational Administration)

Tracking, the separation by academic ability, distributes unequal educational experiences in almost all US public schools for students; hence a contributor to the educational disparity between white and minorities (Blacks and Latino/as in this study). We explore perceptions of tracking in predominantly minority schools (schools where Blacks and/or Latino/as comprise more than 90% of the student population) based on experiences of high-achieving minorities who attended predominantly minority high schools by interviewing five SROP students. Research conducted on tracking thus far mostly emphasizes that minority students in high-achieving tracks who attend predominantly white or racially mixed schools feel racially isolated. We propose studying the experiences of high-achieving minorities in predominantly minority schools. This research is important because 1.) tracking exists in almost all US public schools; 2.) predominantly minority institutions have minority students as the majority, concluding race is not a prominent factor among tracks; and 3.) a significant portion of Black and Latino/a students continue to attend schools where they are the majority. We hypothesize that perceptions of tracking for high-achieving minorities who attended predominantly minority schools will differ from those who attended predominantly white or racially mixed schools because predominantly white and racially mixed schools face different structural challenges to predominantly minority schools. While in predominantly white or racially mixed schools, distributing equally the high-quality education among races is ubiquitous is challenging, predominantly minority schools tend to experience challenges in providing a quality education to the overall student population, including those in the high-achieving track.

SOCIOLOGICAL ANALYSIS OF THE ADOPTION AND SPREAD OF STEREOTAXIS MAGNETICALLY-GUIDED CATHETER ABLATION SYSTEM
Megan Penzkofer
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 278
Mentor(s): Daniel Menchik (Sociology)

In the modern medical environment, doctors are constantly inundated with new technology. How do doctors decide which technologies to take on? This question presents itself in the puzzling adoption of Stereotaxis, a computerized, magnetically-guided system used to correct arrhythmias, among cardiac electrophysiologists. In a field where strong tactile skills are the highest indicator of respect, a shift from manual, hand-guided procedures to the use of a joystick reaches beyond the simple explanation of medical need. This leads to a question: To what extent are other factors, such as interprofessional competition and resource dependence responsible for the adoption of Stereotaxis among cardiac electrophysiologists? Patient data from Sparrow Hospital was used to address whether there is a specific medical need for magnetically-guided catheter ablation. To address potential sociological factors at work, data was collected through a content analysis of a series of academic journal articles about Stereotaxis, taken from respected journals of electrophysiology and from an extensive list offered by the research director at Stereotaxis. Disclosures in scientific literature, analysis of doctors' relative levels of positivity towards Stereotaxis in their research, and authorship of electrophysiology guidelines (2007 and 2012) were also used to create models of social hierarchy and monetary exchanges in the field. The data revealed that more "elite" doctors tended to maintain a greater level of neutrality towards Stereotaxis than those with lower status. This gives insight to the nature of the pattern of adoption of the technology among electrophysiologists.

SOCIAL HIERARCHY OF THE SPOTTED HYENA

Daniel Claiborne
Home Institution: North Carolina A&T State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 2, 1:00 PM - 2:00 PM
Poster: 279
Mentor(s): Eli Stauss (Zoology)

Spotted hyena (Crocuta crocuta) social groups consist of clans in which adult female hyenas hold power, and dominance hierarchy is based on matrilineal pedigree. Rank greatly influences a female's reproductive success by granting her priority status during competitive feeding. Despite understanding the role hierarchy plays in hyena social groups, the magnitude of disparity between ranks remains unclear. This study uses the outcome of agonistic behaviors to quantify steepness of the social hierarchy. The data analyzed were collected by observing a population in the Talek region of the Masai Mara National Reserve in southern Kenya during the years 2001, 2002, 2005, 2006. Agonistic interactions were collected through field observation between the hours of 6:00 am to 9:00 am and 5:00 pm to 8:00 pm. David's scores created from a rank matrix were used to determine the steepness of the dominance hierarchy based on agonistic behavior. The agonistic interactions determine the steepness of the hierarchy of a hyena clan. These measures of hierarchical properties will provide us with a numerical estimate of the magnitude of disparity within the clan. The slope calculated from them will represent the magnitude, that will later be used for comparison among other clans. With these results, a model of describing disparity in social groups can be developed. The model will help to investigate the biological implications and forces that contribute to disparity.

ASSESSING THE RECOVERY OF LEAN MANUFACTURING COMPANIES AFTER NATURAL DISASTERS

Rebekka Pace
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 281
Mentor(s): Claudia Rosales (Supply Chain Management)

BACKGROUND AND PURPOSE: Lean manufacturing is a concept derived from the Toyota production system which refers to achieving high customer service with minimal levels of inventory investment. In assessing companies that are lean our goal is to understand the rate at which the companies that are lean have been able to recover from the Japan tsunami and Thai floods. Lean manufacturing is a concept essential to the development of more efficient companies which is why this study is important in understanding supply chain concepts and business recovery. METHODS: We examined the security exchange and commission reports through the Edgar company fillings. Each company submits either annually or quarterly in response to whether or not the company is affected by the tsunami or Thai floods. In this analysis we have a designated spreadsheet that categorized each company by industry in which we explore statements from each business evaluated qualitatively. RESULTS: Based on the evidence our results are inconclusive as the study develops. CONCLUSION: Analyzing the global supply chain disruptions in regard to lean manufacturing companies the supply chain risk and recovery is an important factor to consider in business preparedness and also consumer influence. In assessing these factors it is beneficial to evaluate updated company fillings qualitatively and contributing factors to supply chain disruptions. FUNDING: Michigan State University Summer Research Opportunities Program.

BELONGING AND MATTERING: BLACK STUDENTS' PERCEPTIONS OF CAMPUS CLIMATE AND ENVIRONMENT AT A PREDOMINATELY WHITE INSTITUTION

Christian Bonilla
Home Institution: Morgan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 282
Mentor(s): Christa Porter (Educational Administration)

Black students have enrolled in colleges and universities throughout the county, yet graduation rates between Black students and their peers remain a noticeable difference causing scholars to question whether the progress is sufficient. Previous literature focused on discrimination of Black students, but has not resolved what can be implemented specifically to help students' progress successfully through their college careers. This qualitative study will examine the narratives of Black students at State University, a predominately White institution in the Midwest. This study is grounded by two conceptual frameworks – sense of belonging

(Strayhorn, 2012) and marginality and mattering (Schlossberg, 1989a). Participants will be asked to share perceptions of campus climate and identify environmental factors that influence their sense of belonging and engagement on campus.

AN INDISPENSABLE BALANCING ACT: MACROSCOPIC AND MICROSCOPIC READING FOR SUBVERSIVE NON-CITATION IN DIDEROT'S ENCYCLOPéDIE

Scott St. Louis
Home Institution: Grand Valley State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 283
Mentor(s): David Eick (Grand Valley State University: Modern Languages and Literatures)

My poster will build on the groundbreaking research of literary scholars Dan Edelstein, Robert Morrissey, and Glenn Roe in the burgeoning field of the digital humanities. By utilizing the search capabilities offered with the digitized ARTFL version of Diderot's Encyclopédie (published between 1751 and 1772), I find that the carefully designed "macroscopic" methodology of Edelstein and his colleagues must be tempered by ongoing "microscopic" analysis of digitized source material. Thus, digital tools designed for historical research have both remarkable value and noteworthy limitations. The use of sequence alignment programs and massive online databases can yield important new insights in cultural history, but these findings must be balanced by "close" reading of documents relevant to the research question(s) at hand.

COMPETING DYNAMICS: ANALYZING MARKET SHARE IN A DUOPOLY

Tai Nguyen, Osvaldo Diaz-Rodriguez
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 284
Mentor(s): Mark Iwen (Mathematics, Electrical and Computer Engineering), Hyejin Kim (University of Michigan Dearborn: Mathematics), Tsvetanka Sendova (Mathematics)

One of the main measures of success in business is a company's market share. In this paper we study two car manufacturers in a duopoly setting. The purpose of this research is to measure the competition between them in terms of market share. We develop two car manufacturer models, based on ordinary differential equations, in order to study a company's success in the market. One model only takes into account the costumers' attraction to a certain manufacturer (e.g. the lower the price of the car, the higher the quantity demanded); and another model includes this attractiveness, and research and development (R&D). By analyzing the influence attractiveness, in terms of price, and research and development have on the success of each company, we attempt to see which one gains the highest percentage of the market. We analyze various assumptions to determine the equilibrium points, and their stability, for the market share of each firm.

BREAKING INTO THE BOYS' CLUB: A SOCIOLOGICAL STUDY EXAMINING GENDERED EXPERIENCES IN SCIENCE

Madison Fitzgerald
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 285
Mentor(s): Nancy DeJoy (Writing, Rhetoric, and American Cultures)

The purpose of the study is to understand gendered experiences in science for women, using the Michigan State University Department of Physics and Astronomy to gather data. It, first, defines "equality", second, evaluates the data, and third, comes to a conclusion on how "equal" science is for women. The critical questions examined in this study are: 1) Do women experience science differently than men?; 2) If so, how, and how does this affect science itself?; and 3) If these gendered divisions do not exist, what could this mean for the future of equality in society as a whole? The project confronts repressive gender-based policies and habits of mind in science to understand gendered power dynamics in science itself and the scientific workplace, the socialization of science and math as masculine, social inequality of men and women, and the glass ceiling.

DOES EMPLOYEE SATISFACTION REALLY LEAD CUSTOMER SATISFACTION?

Zixuan Zhang
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 3, 2:00 PM - 3:00 PM
Poster: 286
Mentor(s): MiRan Kim (The School of Hospitality Business)

In the hospitality industry, employees have been recognized as essential assets. It is critical for managers to attract and retain qualified employees who can deliver high quality customer service to make customers happy and, ultimately, increase profits of the organizations (Chang & Chang, 2007; Grönroos, 1994; Papasolomou & Vrontis, 2006). In particular, the needs to manage employees' satisfaction quite important as satisfied employees are more likely to provide better customer service (Hartline & Ferrell, 1996; Yoon & Suh, 2003). The purpose of this study is 1) to examine the positive relationship between employee satisfaction and customer satisfaction, and 2) to investigate the role of employee commitment to customer service as a mediator between employee satisfaction and customer satisfaction. Employees and customers of a hotel, which is independently owned and operated in the Midwest United States were selected to examine the relationships among the three constructs of employee satisfaction, employee

commitment to customer service, and customer satisfaction. Hospitality managers may apply the findings in developing their human resources management strategies more effectively.

BORDERLINE PERSONALITY DISORDER AND PATTERNS OF WARM BEHAVIOR AMONG MARRIED COUPLES
Stephanie Price
Home Institution: California State University, San Marcos
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 288
Mentor(s): Christopher Hopwood (Psychology), Katherine Thomas (Psychology)

Borderline Personality Disorder (BPD) is characterized by identity problems, abandonment concerns, impulsivity, and emotional and interpersonal lability. The aim of our study is to examine associations between borderline features and patterns of warm behavior in a sample of married couples. Participants were 140 heterosexual cohabiting couples with a biological child between the ages of three and six, recruited from the Chicago, IL area. Data were collected in a laboratory setting using self-report questionnaires and four video recorded discussion tasks. All videos were coded by four research assistants to capture ratings of friendly behaviors on a scale from -1000 to 1000 (least to most friendly) twice per second using a computerized joystick system. Due to the consistency of behavioral patterns across tasks, data were collapsed across the tasks to yield reliable estimates of warm behavior patterns. We used correlational and actor-partner interdependence modeling approaches to evaluate associations between borderline features and the a) levels and b) variability of warmth exhibited during these tasks among husbands and wives. Borderline features among husbands were associated with lower levels of warmth for both husbands and wives. Husbands with more borderline features also varied more in warmth. Interestingly, borderline features of wives were not associated with warm behavior level or variability for either partner. Results indicate that, when borderline features are present in a husband, his closeness to his wife may be relatively unstable, and overall levels of warmth are likely to be lower than otherwise for both partners.

SPEECH BREATHING CHANGES WITH AGE
Saisha Johnson
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 289
Mentor(s): Eric Hunter (Audiology)

It is a natural occurrence that as we get older with age our voice, along with many other things, may begin to change. This is just an inevitable part of getting older that can be somewhat adjusted but not stopped. The vocal tract is a very important cavity where sound is produced and that most people take for granted. We used five minute samples from six subjects. The speeches span several decades for each individual. Using ELAN, programming software that is used to listen to the speeches and record the marks and breaks, speech breath groups were marked and the timing information was analyzed in Excel, to document the data and results. With this research, we hope to see if we can detect the inevitable change in speech breathing. Using this information, inferences can be made to how the speech production mechanism changes as people age. The results will help us better understand age related changes speech breathing and to increase our knowledge in what is normal for breathing and eventually help the aging population.

THE CONTENT NETWORK
Cody Baker
Home Institution: University of Evansville
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 290
Mentor(s): Emilee Rader (Communications Arts & Sciences)

The massive rise in popularity of social networking sites has exacerbated a common problem in the communication sciences: information overload. To combat this issue, the designers of certain social networking sites have recently begun to utilize methods of algorithmic curation. These methods are analogous to recommender systems that present users with items most likely to be enjoyed, such as Netflix's movie recommendation. The critical difference between such a system and algorithmic curation is that curation will purposefully deny the user certain information, rather than simply 'sorting' all existing information according to likelihood of consumption. A prime example of such behavior is Facebook's News Feed algorithm. Though the exact details of such a system are a well-kept secret, it is known via prior studies that the News Feed will often choose to not display posts from certain individuals. The goal of such a behavior is to maximize user interest according to the popularity of content. Though these methods are common, very little is known regarding the large-scale implications of such limiting effects on the diffusion of information. In seeking to understand these effects, we built a detailed computer simulation of a social network, and conducted experiments on various parameters of the system. Through this, we uncovered curious details regarding the structure of an individual's content network; the sub-set of their typical friend network that is regularly informed of the individual's activity. This knowledge aids us in predicting the consequences of withholding information and the subsequent influence on diffusion through the network.

THE GREAT DECLINE: CAN THE DECLINE IN THE JUVENILE CRIME TREND BE DETECTED IN SELF-REPORTING?
Shavonda Johnson
Home Institution: The Ohio State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 291
Mentor(s): Chris Melde (Criminal Justice)

Many studies have attempted to uncover the reasons behind the now two decade long decline in juvenile violence. Extent research on this decline in youth violence has focused almost exclusively on two sources of data, official police reports and victimization surveys. The current study makes use of a unique opportunity to utilize two multi-site panel self-reported data sources gathered across the 1990s and mid- to late-2000—the two national evaluations of the Gang Resistance Education And Training (G.R.E.A.T) Program—to determine whether the decline in youth crime and violence can be detected in self-report studies. The first dataset was collected between 1995 and 1999, and the second study collected data between 2006-2010. Youth self-reported violence was limited to simple assault, aggravated assault, robbery, and gang fights. Changes in both the prevalence and frequency of delinquent behavior will be examined across time to determine whether or not self-reported involvement in deviance conforms to national trends across time. We expect to find significant declines in both the prevalence and individual offending rates (lambda).

CHILD OBESITY PREVENTION

Justus Grant
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 292
Mentor(s): Jina Huh (Communication Arts and Sciences)

Here in the United States, child obesity is becoming a nationwide problem and requires action. Our resolve is a mobile application that will enable children to manage their weight and live a healthier lifestyle by playing games. The games will require the player to engage in various physical activities alone and with his or her family. We are currently developing a technology that will use the device to record sounds and determine things such as whether or not the children are eating alone. This will be used to help the application keep track of the actions the user takes that affect his/her health. In order to bring this application to life, we are currently developing various game scenarios to keep users active on our application for months at a time. We are also developing a reward system that will provide incentives for the users virtually and we are exploring the possibility of providing physical rewards. The goal of this application will be to help children live healthy lifestyles by engaging them in fun games that connect them with their families and communities. They will be rewarded for successfully completing the challenges, thus, taking another step away from being overweight and/or unhealthy.

URL-BASED TOPIC MODELING

Nathan Klein, Shiwani Bisht
Home Institution: Oberlin College, Cornell University
Category & Time: Social, Behavioral, and Economic Sciences, Section 4, 2:00 PM - 3:00 PM
Poster: 293
Mentor(s): Emilee Rader (Media and Information), Kami Vaniea (Media and Information), Rick Wash (Journalism)

It is well known that people prefer webpages that load quickly. Prefetching is a technique used to reduce latency on the web by predicting which website a user will likely want next and loading it before it is requested. In an attempt to improve current prefetching methods, we propose and evaluate the effectiveness of a new model of web behavior we call “URL-based Topic Modeling.” Instead of taking the actual content of web pages into account, this model treats each web session as a document of URLs visited, and splits individual URLs into word vectors. We then use latent Dirichlet allocation, a topic modeling algorithm, to assign topic distributions to each session and website. Using a trained LDA-inferencer along with KL-divergence, Hellinger distance, and first shared topic, we measure the topic similarity between a current session and possible future web pages to improve first-order Markov models and decision-regression trees in prefetching. After evaluating our methods on three datasets – NASA’s web server logs, Boston University’s client-side logs, and MSU BITLab’s own client-side logs – we find that URL-based topic modeling increases the accuracy of prefetching over baseline methods. We believe this method may be able to improve state-of-the-art prefetching approaches. We also think it also has interesting implications for better understanding users’ web browsing behavior.

WHAT DID COMPANIES DO AFTER DATA BREACH?

Zexi He
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 294
Mentor(s): Xuefeng Jiang (Accounting and Information Systems)

The Target Corporation, the second-largest discount retailer in the United States, suffered from security breach that potentially involved millions of customer credit and debit card records in 2013. As negative effects of data breach continued, Target announced the resignation of its Chief Information Officer and a set of practices in response to the data breach. With our initial research, we found that Target was not the only company that faced the problem of data breach. As a result, we are interested in the companies' reactions to data breach and if those actions rebuild companies' reputation.

WHAT DOES COMPUTER SECURITY COST YOU?

Shiwani Bisht, Nathan Klein
Home Institution: Cornell University, Oberlin College
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 295
Mentor(s): Emilee Rader (Media and Information), Kami Vaniea (Media and Information), Rick Wash (Journalism)

Computer users who are tired of responding to security dialogs, updating software, and running system scans often complain about the amount of time they spend interacting with security-related tasks on their computers. These users may change default security settings to avoid these activities, but at what cost? In this study, we investigate how much time the average computer user spends interacting with computer security using data collected from Microsoft Windows 7 and 8 users over a period of a week. After collecting data from users, we found the average number of times that a user performs security-related activities per week, and estimated the time spent on these interactions based on previous work. We discuss the challenges of identifying, through computer logs, when users are interacting with security versus when the system is performing security-related tasks on the user's behalf. Security professionals continuously tell users how important it is to practice good security behaviors, but rarely consider the amount of time practicing good security takes.

EFFECTS OF RACE, INCOME, AND TYPE OF COMMUNITY ON ENVIRONMENTAL PROTECTION
Brenda Becerra
Home Institution: DePaul University
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 296
Mentor(s): Richard Hula (Political Science)

New presidential elections will be coming up soon and it is a time to re-evaluate the government's efforts on environmental protection. It will be interesting to see what will be the first order of business on the political agenda. Although there have been efforts made towards the protection of the environment there are still many communities being affected by environmental issues most being low-income minorities of color. Environmental racism according to literature is when low-income or minority communities (African Americans, Latinos, and Native Americans) are placed in environmentally hazardous or degraded environments. This paper explores income, race, and type of community and how it affects people's attitudes on the government's efforts towards environmental protection. Low-income African Americans that live in urban areas are more likely to think the government is not doing enough towards protecting the environment. This hypothesis is examined by doing quantitative analysis with State of the State Survey data. Multiple regression analysis and Pearson's correlation will be conducted to see if there are significant relationships between income, race, type of community, and attitudes on environmental protection. This research can better inform communities on the social factors that influence environmental decision making.

HISTOLOGICAL AGE-AT-DEATH ESTIMATION FOR FRAGMENTARY REMAINS
Rachel McConnell
Home Institution: The Pennsylvania State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 297
Mentor(s): Amy Michael (Anthropology), Gabriel Wrobel (Anthropology)

Forensic anthropology and bioarchaeology have sought to improve and expand upon methods of accurately and reliably estimating age at death, which aids legal investigation aimed at identifying specific individuals based on their biological description. Bioarchaeological investigations of age-at-death among individuals typically focuses on comparisons of patterns of health within and between ancient populations or interpretations of burial practices within specific contexts. This study uses a histological method described by Pavon et al (2010) to determine the ages of twelve (n=12) Classic period (AD300-900) Maya skeletons buried in the Caves Branch and Sapodilla rockshelters in Belize. Specifically, cross sections of 4th ribs were examined microscopically to generate several measures that are known to vary predictably with age. Osteon Density Count (OPD), Cortical Area (CA) and Osteon Size (OS) were incorporated into algorithms to estimate the age-at-death of the better preserved adults within the collection. The microscopic age at death estimates were than compared to the age at death estimates generated from the macroscopic age markers.

PATENT ASSERTION ENTITIES: INNOVATION ACCELERATORS OR INHIBITORS?
Benjamin Griffis
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 298
Mentor(s): Ralph Heidl (Management), Clay Voorhees (Marketing)

Patent Assertion Entities (PAE's) are companies that are structured as a parent organization with multiple specialized shell companies that specialize in the aggregation, monitoring, and enforcement of intellectual property rights. PAE's do not invent or commercialize intellectual property, instead they act as independent distributors, purchasing intellectual property from inventors and selling the rights to commercializing entities. Currently, PAE's control a significant portion of all of the intellectual property assets. PAE's operate similar to Venture Capital and Private Equity Funds and are regularly involved in extensive legal action, using patents with very generalized claims to swiftly sue a multitude of companies producing products that are produced along those blurred lines. PAE's have prompted various questions, notably if they empower or underpay inventors, if they incentivize innovation or enforce frivolous patents, and if they reward low quality patenting efforts. Using data from 2001 to 2011, we aim to see if PAE Intellectual Property (IP) litigation, holdings, or purchases influences patenting activity attributed to both larger and smaller organizations in subsequent years, along with how inter-company relationships are affected after an organization sells patents to PAE's.

THE 360 DEGREE : AFRICAN AMERICAN STEM MAJOR EXPERIENCES AT PREDOMINATELY WHITE INSTITUTES AND HISTORICALLY BLACK COLLEGES AND UNIVERSITIES
Christina Pressley
Home Institution: Wheelock College
Category & Time: Social, Behavioral, and Economic Sciences, Section 5, 3:00 PM - 4:00 PM
Poster: 299
Mentor(s): Terah Venzant-Chambers (Educational Administration)

When it comes to the field of STEM minorities are significantly underrepresented, particularly African Americans. While many African Americans enter college and universities pursuing STEM majors, the problem is that many are not graduating as STEM majors. This is result of environmental factors such as school support, peer support, professors and advisors. However, Historically Black Colleges (HBCU) put more African Americans in the STEM filed than Predominantly White Institutes (PWI). More African American doctors, engineers, biologist, etc. have earned undergraduate degrees from HBCU's then PWI's and have advanced in their fields of study. In this research, two focus groups were created. Fourteen African American male and female students were placed into to focus groups. One focus group was with six African Americans who attended a PWI's. Eight African Americans were in a focus group who attended a HBCU.

INTERACTIONS BETWEEN SECURITY INTERFACES, LEARNING, AND SENSITIVITY OF INFORMATION
Lezlie Espana
Home Institution: Wisconsin Lutheran College
Category & Time: Social, Behavioral, and Economic Sciences, Section 6, 3:00 PM - 4:00 PM
Poster: 300
Mentor(s): Rick Wash (Journalism)

From locking the car to logging in to a favorite social network site, people interact with security on a daily basis. When people lock their keys in their car, they learn something and adjust their behavior accordingly. Applying this idea to internet security, our research looks for ways in which people learn about what information should be kept secure. Our goal is to see if people learn about online security through their interactions with security interfaces. Do people learn from having to log in to see information on websites? How does this learning affect their security behavior? We developed an experimental website where we manipulated the ways in which participants interacted with information and the login process. By having participants log in to see information that was hidden and then allowing them to choose privacy settings based on the information they saw, we hope to demonstrate that people can learn about online security. A better understanding of how people learn through these interfaces can help us further explain and encourage secure behavior. This poster will present the first step in understanding what people learn about sensitive information and how that learning is affected by the security interfaces involved.

STRATEGIC SUPPLY CHAIN SOLUTIONS IN HOSPITAL BUDGET MANAGEMENT
Raul Jimenez
Home Institution: St Mary's University
Category & Time: Social, Behavioral, and Economic Sciences, Section 6, 3:00 PM - 4:00 PM
Poster: 301
Mentor(s): Claudia Rosales (Supply Chain Management)

As a result of the expenses associated with the procurement of medical equipment and supplies, many hospitals come together and form group purchasing organizations in order to negotiate a better price from the respective vendor. Our goal is to decrease the margin of error in supplies estimates and therefore reduce any costs associated with maintaining extra inventory or having to purchase more. This will be done by optimizing the supplies budget and expense accounts for a nonprofit hospital system based in Detroit, using visual basic coding to create, calibrate, and manage a multitude of data held in excel spreadsheets. Our expected outcome will allow the hospital to better forecast their need for supplies, minimize margins of error, and maintain appropriate inventory.

CROWDFUNDING: DONOR BEHAVIOR AND DONATION TIMING
Katie Hoban
Home Institution: Michigan State University
Category & Time: Social, Behavioral, and Economic Sciences, Section 6, 3:00 PM - 4:00 PM
Poster: 302
Mentor(s): Rick Wash (Journalism)

A crowdfunding website is a site where project creators ask for public donations to fund their projects. However, at any given time, there could be hundreds of active projects and thousands of donors on these websites. The only way projects can be successfully funded is through the collaboration of donors and creators. There is also an element of coordination among the project donors, in that they must choose whether or not (and if so, when and how much) to donate to each project. To better understand donor coordination, we ran an experiment in which participants coordinated to fund various projects in a crowdfunding simulation. In previous rounds of the experiment, we found that users took various donation strategies, some choosing to donate early on, while others decided to "free ride", letting other donors fund the projects. In these rounds, we hope to further explore patterns of donor behavior on crowdfunding websites, particularly the way donors learn across multiple rounds of donating.

LATINA EMERGENTS IN LOCAL POLITICS

Paola Chavez
Home Institution: University of Illinois at Chicago
Category & Time: Social, Behavioral, and Economic Sciences, Section 6, 3:00 PM - 4:00 PM
Poster: 303
Mentor(s): Eric Juenke (Political Science)

Latina women are the one of the most underrepresented demographics in elective office today but there is a very limited amount of research explaining why this is true. Until very recently, there has been a huge gap in the research pertaining to women's underrepresentation in elective office in general. Studies that have been conducted looked at the candidate emergence process, the decision to run for office, and have found that factors such as family structure, political party affiliation, recruitment practices, education, and funding have had a strong effect on whether or not women run for office. My research will also look at the candidate emergence process, but will be focusing on why Latina women run for office as well as what differentiates them from other candidates, such as white women or white males. I will be conducting a collective case study in which I will interview different politicians about their political ambition and find common themes. I anticipate that my findings will yield that the strongest deciding factors in the decision to run for office will be cultural background, presence of role models, money, and professional experience. These findings will lay the foundation for future research in this field, specifically to create surveys and look at this in a larger scale. It will also be important to interview women who did not run for office in order to get a better picture of the candidate emergence process, especially pertaining to Latina women.

AN ANALYSIS OF INTEGRATED PROJECT DELIVERY VIDEO REPRESENTATIONS

Hunter Salem
Home Institution: Cornell University
Category & Time: Social, Behavioral, and Economic Sciences, Section 6, 3:00 PM - 4:00 PM
Poster: 304
Mentor(s): Vernon Miller (Communication)

This study seeks to identify communication processes and structural components that are important in the Integrated Project Delivery (IPD) approach to building construction. In a typical construction setting, subcontracting firms finish project assignment and leave, with little or no communication to other entities, often leading to decreased efficiency and increased costs. IPD is a coordination method in which all subcontracting firms work closely with the owner and one another throughout the project via regularly scheduled, weekly meetings and ongoing information system dialogue. Identifying essential components of successful IPD teams will allow firms to reduce unnecessary waste and costs, leading to a more satisfied client population. Three forms of public representations of the IPD process are currently disseminated on the web. Informational, webinars, and advertisements display the videographer's interpretation of IPD's vital elements for their intended audiences. These representations are important because they identify components that practitioners view as vital to IPD project success. Using a sample of 30 videos available on the Internet, trained coders will analyze the video's structure (e.g., length, production quality) and content (e.g., early involvement, innovation-value fit, cohesion, communication behaviors) identified through already published research. Chi-square analyses will be the predominant statistical test to compare differences in structure and content across types of videos. It is anticipated that the findings will offer insights into how these teams achieve coordination and which factors they find essential to successful IPD projects.

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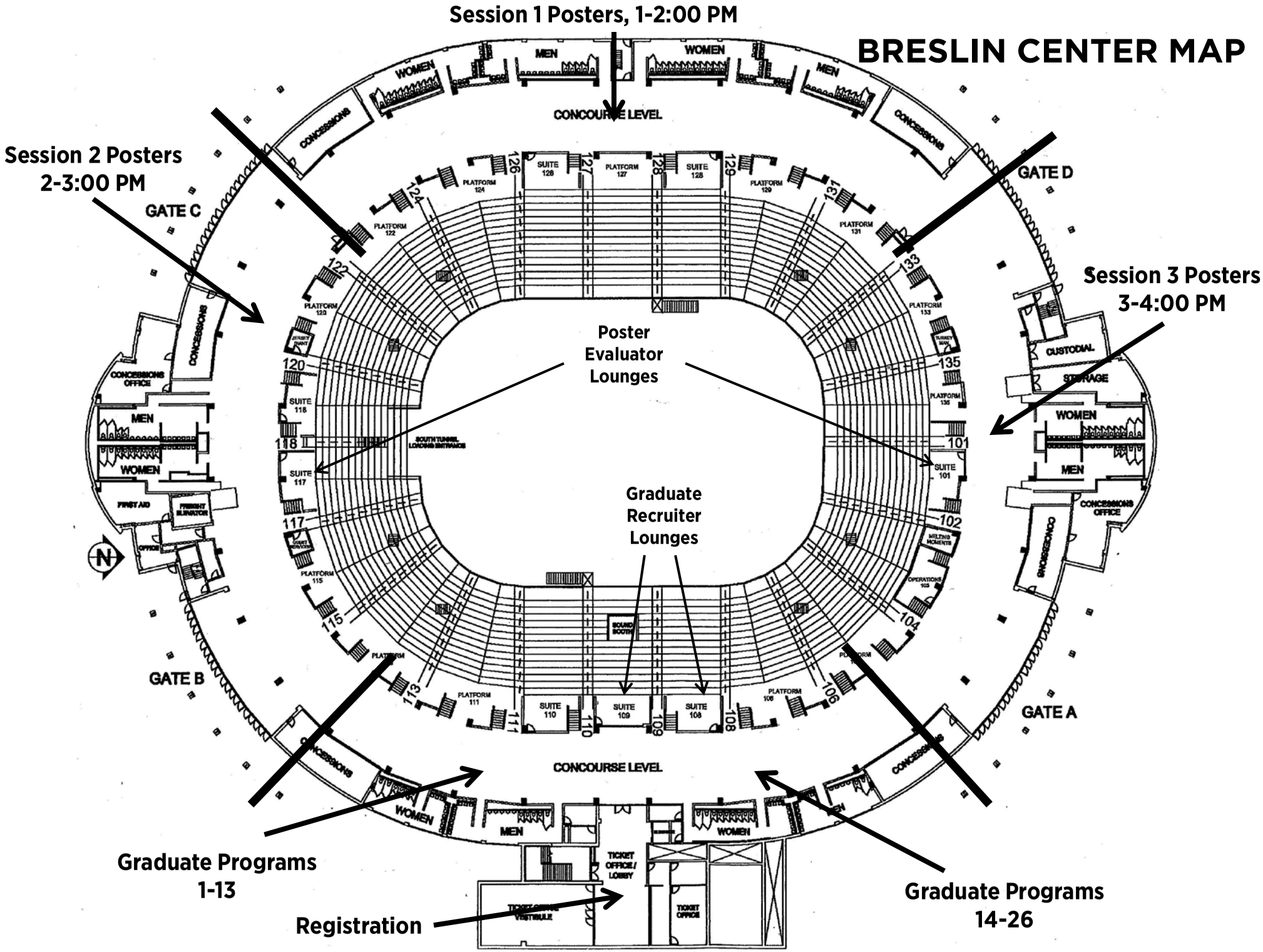
PRESENTER INDEX

Presenters are listed alphabetically by last name.

BRESLIN CENTER MAP



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