UNDERGRADUATE RESEARCH & POSTER SYMPOSIUM

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ABSTRACTS

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Student Abstracts

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College of Agriculture

Innovative Technology/Entrepreneurship/Design

Poster Number 10: Danika Miller

EFFECTS OF PROBIOTIC SUPPLEMENTATION AND FREEZING RATE ON LIPID AND PROTEIN OXIDATIONS OF CHICKEN MUSCLES

The oxidation of meat components, particularly lipids and proteins, has substantial adverse impacts on human health and nutrition as well as quality attributes. Oxidation of fatty acids as well as protein amino acid side chains reduces nutritional value of lipid and protein, respectively. The breakdown of the oxidized components can cause a generation of toxic compounds including malondialdehyde, 4-hydroxynonenal, and cholesterol oxidation products according to recent research (Soyer et al., 2010). Reducing the oxidation of chicken products is of interest due to chicken's high proportion of polyunsaturated fatty acids, which are highly prone to oxidation during storage. Poultry diet as well as product storage have been found to effect meat quality and shelf-life. Probiotic supplementation to poultry diets have been proven to increase bird health and growth. There has been little research done on the impact of probiotics on meat quality and oxidation stability. In this study we evaluated the effect of freezing rate as well as probiotic supplementation on meat quality. A total of 23 birds were selected for data collection from two dietary treatments fed for 45 days: basal diet and basal diet with 250 ppm Sporulin (1.0 × 106 cfu/g of feed). We sampled both breast portions from each bird and froze half fast freezing (liquid nitrogen chamber) and half slow freezing (conventional freezer). Then half of each treatment was thawed and stored for 1 or 3 days accordingly. There was a significant difference ($p<0.05$) in % water holding capacity in both freezing effects and storage effects. Also, probiotic supplementation shows a significant effect ($p<0.05$) on thiobarbituric acid reactive substances (TBARS) assay, peroxide value (PV), and phospholipid content which are indicators of lipid oxidation. Therefore, fast freezing and probiotic feed supplements have positive impacts on broiler meat quality.

Innovative Technology/Entrepreneurship/Design

Poster Number 13: Yazmin Rendon Munoz

Evaluation of the pathogen decontamination and physicochemical properties of milk after High Voltage Atmospheric Cold Plasma (HVACP) treatment

There is a growing concern for food pathogens worldwide; it was reported that 13.36% of the outbreak was caused by the consumption of dairy products contaminated with food-borne pathogenic bacteria, including Salmonella spp. High Voltage Atmospheric Cold Plasma (HVACP), as a non-thermal food processing technology, has been applied into reducing the microbial concentration in the surface of solid food. In order to explore the application of this technology into food safety procedures, HVACP has been evaluated with liquid food systems. Skim milk inoculated with Salmonella spp has been treated for 5, 10, 15 and 20 minutes with air and modified gas (MA) as plasma source, following 24h incubation. Results showed a 5 log reduction after 15mins with air as packing gas, 10mins with MA, respectively. The quality of the pH, color, conductivity and total titratable acidity were also evaluated. Results indicated that HVACP can be applied as a non-thermal decontamination technology into milk processing without affecting the milk quality.

Innovative Technology/Entrepreneurship/Design

Poster Number 1: Andrew Kluttz

A Comparative Study of the Formation of Trichomes in Arabidopsis and its Relation to Cotton Fibers

The genetics behind the formation of trichomes in Arabidopsis is based on the same set of genetics that cause the creation of cotton fibers in cotton. By finding the genes that are known to impact the trichome formation in Arabidopsis and the homologous genes in cotton, a clear similarity will be found in the phenotypes if these genes are knocked out.

Life Science

Poster Number 2: Shiyu Cai, Erika Cabezas

Bacteriophage Infection in Ground Beef

Bacteriophages are viruses that can infect bacteria, replicate, and ultimately lyse the host cell. They do not infect humans and have specificity at the genus, species, and strain level, which makes them an attractive alternative for traditional antimicrobial agents. Bacteriophage disinfection is a completely safe and economical technology that leaves no corrosive or toxic residuals in food or food processing facilities. Previous studies have shown the lytic phage to be

useful for reducing Escherichia coli O157:H7 contamination in fruits, vegetables, and ground beef. However, whether the bacteriophage and target microorganisms commingle on the food surface requires further study. The purpose of this study is to verify whether the infective event occurs in the food matrix. In this work the temperate E. coli O157:H7 phage phiV10 was used to deliver a plasmid containing the lux genes, which when expressed, causes the host to bioluminesce. The phage was grown on an E. coli O157:H7 containing the plasmid pCR2.1 and the transducing phage particles were harvested by filtration of the lysate. Infection assays were performed using dilutions of phage and bacteria. Once inoculated, the samples were incubated overnight at 37°C followed by image analysis using a CCD low light camera. Controls using a bioluminescent O157:H7 showed luminescence indicating minimal inhibition of visible light. However, no transduction events were detected. The negative results may be due to transduction efficiency. Future work using a phiV10 with a genomic integrated nanoluc could be advantageous as it produces a brighter signal with all infective events.

Life Science

Poster Number 3: Rebekah Lumkes, Sarah Meronk, Natalie Euler

Comparing Species Richness and Activity at Northern River Otter Latrine Sites and Non-latrine sites in Northern Indiana

Interspecific competition occurs when two species exploit the same resource, or must share resources in a particular niche. In Indiana, northern river otters (Lontra canadensis) were reintroduced in 1995 and have successfully inhabited many of the state's waterways. Because of these recent reintroductions, competition for space and food is likely occurring between otters and other species that occupy a similar niche. To evaluate this competition, we studied otter activity and species richness at 5 sites in northern Indiana. We hypothesized that the presence and activity of otters at latrines would affect the behavior patterns of other riparian species at these same sites. We used remote cameras to compare species richness, visitation rates, and diel activity patterns at otter latrine sites and paired non-latrine control sites. Results show that monthly mean species richness was significantly lower at control sites than at latrines ($p=0.014$). We did not find a significant difference in visitation rates of species between latrine and control sites ($p=0.10$). Raccoons were significantly more nocturnal at control sites than at latrine sites ($p=0009$). It is clear that otter latrine behavior affects other carnivore species in Indiana riparian systems. More research is needed to determine the mechanisms that produce those behavioral effects. /

Life Science

Poster Number 4: Austin Egloff

Corpus luteum blood flow correlation with circulating progesterone during the bovine estrous cycle.

The purpose of this study was to evaluate a subjective scoring system to evaluate corpus luteum (CL) function during the beef cattle estrous cycle as a means to evaluate CL function in recipient cows. Sixteen open Simmental/Angus cows ranging from ages of 2 years to 6 years (mean age = 3) were randomly selected from the Purdue Animal Research Education Center. Cows ranged in BCS from 4.33 to 7 (mean = 5.10) and ranged in body weight from 1025-1645 (mean = 1318.44). Blood samples were collected every day for 28 consecutive days via venous jugular puncture. The blood samples were collected in vacutainer tubes containing EDTA. It was then spun using a centrifuge and froze. Plasma progesterone concentrations were determined via Immulite 1000 progesterone kits by Siemens. The kits test on a solid phase, competitive immunoassay utilizing the enzyme labeled chemiluminescent technology. Transrectal ultrasonography was performed every other day to visualize the ovarian structures (Sonosite Micromaxx). If a CL was present, a Color-flow Doppler sonography subjective score was recorded on a scale from 0-3 based on the following criteria: 0) no Doppler color; 1) small Doppler color on periphery of CL; 2) up to 80% of CL having Doppler color; and 3) greater than 80% of CL having Doppler color. Results from compiled testing were then evaluated using Spearman Correlation Coefficients in SAS® (v9.3, SAS Inst., Cary, NC). Plasma progesterone concentration was correlated with Doppler score ($r=0.45$, $p<0.0001$) where increasing Doppler score correlated with higher plasma progesterone concentrations. For each cow, a peak progesterone concentration and an average progesterone concentration for the last 4 days where progesterone was elevated in the blood were calculated. Peak and average progesterone concentrations were correlated with age ($r= -0.555$, $p=0.032$) where younger animals had higher progesterone concentrations. Peak and average progesterone concentrations were not correlated

Life Science

Poster Number 5: Chu Yan Chen

Detection of bioluminescent E. coli O157:H7 internalized in romaine lettuce

Foodborne E. coli O157:H7 causes illness in consumers that include diarrhea and hemolytic uremic syndrome. Since 1995, FDA reports that 18 E. coli O157:H7 foodborne outbreaks have been attributed to fresh or fresh-cut lettuce consumption. It is crucial to detect foodborne pathogens rapidly and accurately to prevent outbreaks. Using bioluminescent bacteria detects

the presence of metabolically active E. coli O157:H7 that have great potential to cause illness. This study investigates the internalization of bioluminescent E. coli O157:H7 into the vascular structure of romaine lettuce. We are also evaluating the efficiency of standard industry washing methods on their ability to remove internalized pathogens. Results from this study allow us the opportunity to improve upon established practices to best protect the public.

Life Science

Poster Number 6: Brooke Kline

Detection of Mycoplasma ovis in a goat herd using a quantitative polymerase chain reaction (qPCR) assay

Hemoplasmas are blood-borne bacteria that have a tropism for red blood cells. Mycoplasma ovis (Mo) is a hemoplasma that infects goats and sheep, however there is limited information about its occurrence in goats. Although Mo infection is reported to cause anemia and mortality in young animals, adult animals are typically inapparent carriers that results in an overall decreased production of the herd. The objectives in this study were to 1) investigate the prevalence of Mo in a goat herd in Indiana using a quantitative polymerase reaction (qPCR), and 2) determine if DNA extraction and amplification were different in EDTA versus heparinized blood samples. For objective #1, blood from 98 goats was collected in lithium heparin tubes; DNA was extracted and the dnaK gene of Mo was amplified using a previously validated SYBR® Green qPCR assay. The prevalence of infection within the herd was 1.0% (95% CI: 0.03 - 5.5). For objective #2, serial dilutions (1 to 109 copies/reaction) of a plasmid containing a fragment of the dnaK gene of Mo were spiked into EDTA and heparinized blood samples from an uninfected animal. While higher yields of total genomic DNA were extracted from EDTA blood, there was no consistent difference in the amount of amplified products for EDTA versus heparinized blood. The detection limit of Mo extracted from either anticoagulant was 1000 copies/reaction.

Life Science

Poster Number 7: Abigail Haffner

Early Embryonic Loss in Draft Mares

Early embryonic loss in horses is very prevalent in the equine industry. This contributes to large economic losses for owners and breeders. Progesterone is the major hormone for both the mare recognizing pregnancy as well as holding on to the embryo. Previous studies in light breeds have shown that progesterone levels are increased in pregnant mares. Understanding of progesterone levels and pregnancy rates have been extensively researched in light breeds

but is sparse in heavier breeds, such as the Belgian draft mare. We measured progesterone levels at day seven and day fourteen post ovulation in order to better understand if serum levels could give an indication of whether pregnancy would be viable. To further comprehend early embryonic loss, biological and environmental factors such as presence of cysts, follicle size, ovary side, semen motility, etc. were evaluated. Initial data suggests that at day fourteen, there is a statistical difference between Belgian draft mares that remained pregnant and those that lost their embryo during early development. Similarities between progesterone levels at day seven suggests pregnant mares, non-pregnant mares, and mares that lost their embryo early in development are not statistically different indicating it is too early for predictions. Economic impact is great for potentially recognizing and troubleshooting problem mares. Findings and further research could aid in better management of draft mares and lead to lower costs for the owner.

Life Science

Poster Number 9: Derico Setyabrata

Effect of Dry Aging on Color And Oxidation Stability of Beef Loins

Aging is a common meat industry process to improve eating quality attributes of meat, such as tenderness, juiciness, flavor and overall palatability. While most of studies have focused on determining the effects of various aging methods on eating quality attributes, there is little information on the effects of the aging methods on color and oxidation stabilities of beef muscles. Therefore, the objective of this study was to evaluate the color and oxidation stabilities of beef loins aged with three different methods (wet-aging, dry-aging, dry-aging in bag). At 7 days postmortem, M. longissimus lumborum from beef carcasses (n=10) were removed, sub sectioned, and aged for 28 days at 2 ºC and 78% relative humidity. One steak (2.54 cm thick) from each aged section was cut, overwrapped with PVC film, and displayed for 7 days under light. Instrumental and visual color evaluations were performed during 7 days of display. The 2-thiobarbituric acid reactive substances (TBARS), myoglobin content, and heme/non-heme iron contents were measured for 0 and 7 days of samples. The steak samples from beef loins dry-aged in bag exhibited a rapid discoloration and accelerated lipid oxidation compared to the steaks from both wet-aged and dry-aged beef loins ($P < 0.05$). Our findings suggest that dry-aging in bag would need a strategy to prevent oxidation related quality defects during retail display. /

Life Science

Poster Number 11: Sabrina Schuler, Renee Wickliffe (graduated), Sarah Meronk

Evaluating seasonal and geographic diet variation in North American river otters (Lontra canadensis) in Indiana

The food habits of river otters (Lontra canadensis) in Indiana play a major role in the trophic dynamics of aquatic and terrestrial ecosystems. No research has been conducted in Indiana to evaluate otter diet since their reintroduction in the mid-1990's. Studies in other locations have indicated that composition of otter diet varies both seasonally and geographically and is dependent on prey availability. We wanted to determine what factors affect otter feeding habits in Indiana (e.g., season, geographical region, presence of Asian carp). We conducted gross fecal analysis from 772 scat samples collected from December 2013 through December 2015 from 3 regions in Indiana to determine frequency of occurrence of prey items. We found that prey items vary seasonally and geographically in otter diet. We found that crayfish dominated otter diet during spring (71.7%) and summer (80.0%), but fish was the primary prey source in fall (86.5%) and winter (89.7%). Centrarchidae (e.g. Lepomis spp., Micropterus spp.) was the most heavily preyed fish family, both within and among regions (51.6%). Otter diet from the southern region contained more crayfish than other regions, a likely result of crayfish availability due to warmer climate. The diversity of otter diet reflects the diversity of prey in the systems they inhabit, and likely fluctuates with prey availability.

Life Science

Poster Number 12: ChuYan Chen

Evaluation of standard wash procedures for romaine lettuce using bioluminescent E. coli O157:H7

Foodborne E. coli O157:H7 may cause serious illness in consumers that include diarrhea and hemolytic uremic syndrome. Since 1995, FDA reports that 18 E. coli O157:H7 foodborne outbreaks have been attributed to fresh or fresh-cut lettuce consumption. It is crucial to detect foodborne pathogens rapidly and accurately to prevent outbreaks. Using bioluminescent bacteria detects the presence of metabolically active E. coli O157:H7 that have great potential to cause illness. This study investigates the internalization of bioluminescent E. coli O157:H7 into the vascular structure of romaine lettuce. We are also evaluating the efficiency of standard industry washing methods on their ability to remove internalized pathogens. A photon counting camera was used to spatially quantify internalized bacteria pre- and post-treatment. This method is advantageous to standard culture-based enumeration methods because all internalized bacteria can be accounted for via luminescence detection. Preliminary data has

shown that internalized E. coli is not affected by standard chlorine dioxide treatments. Results from this study allow us the opportunity to improve upon established practices to best protect the public.

Life Science

Poster Number 14: Morgan Cox

Exogenous Amylase in Nursery Pig Diets

Young animals, including newly weaned piglets, are known to secrete relatively small amounts of endogenous digestive enzymes at a young age (Classen, 1996). In order to increase starch digestion for these young animals, amylase supplementation can be included in the diet (Classen, 1996). It is important to maximize digestion of feed ingredients to most efficiently and cost effectively produce quality pork. This study examined the effects on growth performance due to supplementation of exogenous amylase to basal corn-soybean meal based diets for nursery pigs. Four different levels (0, 0.1, 0.2, 0.4%) of amylase (Ronozyme Rumnistar 600, DSM product) were added to the same basal diet within each phase and performance data were collected and analyzed. In this study, the performance levels were expected to improve in the immediate period post-weaning, Phase 1 and 2, due to the known decrease in amylase secretion at this time. With increasing levels of exogenous amylase in Phase 1, there was no effect on ADG, ADFI, or feed efficiency. Phase 2 contained a linear trend ($P<0.0924$) for improved ADFI (0.633, 0.680, 0.651, 0.695 lb/d; increasing amylase, respectively) and numerically ($P<0.1456$) better ADG (0.299, 0.336, 0.327, 0.355 lb/d; increasing amylase, respectively). In Phase 3, the gain to feed efficiency ratio had a significant reduction ($P<0.0483$) at the highest inclusion rate (0.724, 0.745, 0.725, 0.691; increasing amylase, respectively). Overall, the improvement in growth performance across phases was not consistent in this trial with increasing levels of exogenous amylase enzyme.

Life Science

Poster Number 15: Melissa Robins, Kelly Martin, Tatumn Vernon, Richard Chu

Forward and Reverse Gene Trends Found During Genome Annotation of a Novel Mycobacteriophage

Phages are viruses that infect bacterial hosts and are known to be the most abundant forms of life in the biosphere. In order to widen the current knowledge of bacteriophage genetic diversity, a wide span of bacteriophages have been isolated for in-depth observation. A novel phage infecting Mycobacterium smegmatis was isolated from a soil sample collected in West Lafayette, IN and was named Grand2040. The phage was grown in large quantities in order to

create a solution with a high concentration of phage so that it could be archived and used for DNA sequencing. Grand2040 was sequenced at Pittsburgh Bacteriophage Institute and annotated using DNA Master genetic analysis software. During the analysis of the first half of Grand2040's genome, trends identified among forward and reverse genes led to further comparison with the genomes of related phages in subcluster B1. The annotation of Grand2040's genome will be added to the Phagesdb.org database so that information gleaned from the project will be held in the public domain for common use.

Life Science

Poster Number 16: Lindsey Hummel

Hummingbird dominance hierarchy and the effect of permanent feeders on flower visitation

Hummingbird feeders are a popular way to attract hummingbirds for tourism and personal enjoyment. However, the presence of artificial feeders may limit the hummingbirds from pollinating plants because the easily accessed, high resource quality feeder distracts from plant resources. Dominant hummingbird species were expected to have a higher pollen load. This study was conducted in the dry season of April 20-26, 2015 at La Georgina Restaurant and Lodge in the Talamanca Mountain Range, Costa Rica. Four hummingbird species were studied: Panterpe insignis, Eugenes fulgens spectabilis, Selasphorus flammula,and Colibri thalassinus. Mist nets were used to capture 81 hummingbirds and pollen loads were collected with strips of tape. A reference pollen collection of 24 species was used to compare pollen found on captured hummingbirds. Negative interactions and visitations to artificial feeders as well as visits to flowers were collected using timed observation periods. Data was also compared to a study period conducted during the wet season of 2014. Fiery Throated Hummingbirds (Panterpe insignis) were observed to have highest dominance at feeders. Fiery Throated Hummingbirds had the most negative interactions, and the highest pollen loads out of all the species. Additionally, they were observed to have to have the most visits to the feeders and flowers. This did not support the hypothesis that the dominant species would have a lower pollen load than the rest. Additional studies at this site and other sites are necessary to make definitive conclusions. Permanence of artificial feeders could have caused increases in population density of the Fiery Throated Hummingbird, causing the hummingbird to dominate not only feeders but also flowers in the area. Feeders are a beneficial tool for education and research; however this tool must be used with caution to avoid dependency which could affect pollination systems already stressed by habitat loss, exotic species, and climate change.

Life Science

Poster Number 17: Jill Osterhus, Sean Magill, Prasanna Janakiraman

Isolation and Genome Characterization of a Novel Bacteriophage, Hughesyang, from an Environmental Sample with Applications in Medicine, Environment

Hughesyang (http://phagesdb.org/phages/Hughesyang/) is a novel mycobacteriophage isolated in 2014 from a soil sample collected in West Lafayette, IN, in moist soil 10-12 cm below the surface by M. Hughes and J. Yang. Through infection of Mycobacterium smegmatis and direct plating methods, plaques of 2.5-3 mm in diameter were observed. The entire genome has a length of 112,884 bp and a GC Content of 60.9%. Software programs such as DNA Master, Glimmer, GeneMark, Phamerator and NCBI BLAST were used in annotating the genome. / / Our team annotated the middle third of the genome (37600-75300 bp), which primarily consisted of forward transcribed genes, with a large section of reverse transcribed coding potential near the middle of our section, and a few interspersed select genes that were deleted. The majority of our edits to the genome consisted of modifying start sites and deleting genes where necessary, but most of the annotation was based on confirming the pre-existing data generated by the software. / / Many genes in Hughesyang are present in other mycobacteriophages, showing the mosaic trait patterns found in similar phages. That is, phages evolve from other phages and are categorized into subgroups called phamilies, and the genes of a particular pham have a genome composed primarily of a collection of genes common the the members of the phamily. Further investigation into the genome shows that not all genes in Hughesyang are homologous with existing categorized phages. This suggests future work defining these genes could lead to applications into medicine, food safety, and the environment.

Life Science

Poster Number 18: Bofan Xie

Managing bourse shoots to maximize flowering in apples

Apple production depends on reliable flowering from one year to the next. Factors that affect flower induction in bourse buds are critically important for consistent production of apples. Irregular flowering may lead to biennial bearing which is a huge challenge for the apple industry. In order to reduce biennial bearing, this study determines the optimum time of terminal bud set and bourse length for flower induction. / Detailed bourse length measurements were done under two treatments (de-fruited and single fruited) throughout the growing season on two apple cultivars: Honeycrisp (biennial bearing) and Gala (annual bearing). Based on the results, these apple cultivars differed in bourse length, return bloom, time of

terminal bud set and likelihood of having second bourse. The growth of Honeycrisp bourses terminated approx. 42 days after full bloom while the bourses of Gala had consistent slow growth till the end of growing season. Bourse length was negatively correlated with flower formation in Honeycrisp but not in Gala. / These results also suggested that time of terminal bud set can impact flower formation and managing bourse length may be a useful approach to optimize flowering. /

Life Science

Poster Number 19: Ryan Schroeder

Modeling the Hydrologic Landscape-Scale Dispersal of Japanese Stiltgrass (Microstegium vimineum) with ArcGIS and the ArcHydro Toolbox

Japanese stiltgrass (Microstegium vimineum) poses a serious ecological threat to native forest understory and wetland plant communities. In recent years, its dispersal rate into northern states near to the Great Lakes has increased rapidly. It has been observed that M. vimineum disperses by seed dispersal across a landscape, once introduced, via drainage ditches and surface runoff. However, little empirical data or models exists at the landscape-/management-scale to model this dispersal. This geospatial model, developed with ArcGIS and the ArcHydro tool package aims to predict the hydrologic dispersal of M. vimineum seed to create scouting maps to help guide land stewards in the efficient removal of source-patch progeny down gradient of the source patch. This poster is meant to outline the research proposal of this project and the initial investigation of the model concept.

Life Science

Poster Number 21: Jonathan Wu

PREFERENCE FOR WEED SEEDS AND WASTE GRAIN BY NATIVE MICE IN ROW CROP AGRICULTURE

Prairie deer mice (Peromyscus maniculatus) and white-footed mice (Peromyscus leucopus) are found in a variety of habitats throughout the Midwest. For example, both species inhabit row-crop fields (corn and soybean), yet the ecological role that these mice serve within agriculture remains poorly understood. P. maniculatus and P. leucopus are the dominant vertebrate granivores within agricultural fields and likely play an important role in the consumption of weed seeds and waste grain. Evaluating the preference of P. maniculatus and P. leucopus for various weed seeds and waste grain is important to understand the effect that native mice have on regulating weed populations. We evaluated weed seed and waste grain preference using cafeteria-style feeding trials on wild-caught P. maniculatus and P. leucopus. Individual mice

were placed in feeding arenas overnight and presented trays with 1 g of seed from 5 common agricultural weeds and 2 grains (corn and soybean). Feeding trials lasted 12 hours, after which we measured the amount (weight) of seed eaten and used infrared video cameras to monitor foraging behavior and order of seed selection. We predicted that both P. maniculatus and P. leucopus would favor corn and soybean seeds over weed seeds due to their larger size and greater nutritional value. Once mice consumed the available grains, we expected mice would then prefer larger weed seeds compared to smaller ones. This study is valuable because it provides a greater understanding of the impact that native mice have on weed populations and the potential benefits that they provide to farmers by consuming unwanted seeds.

Life Science

Poster Number 23: Brooke Wamsley

Retrospective Study to Determine Presence of Swine Deltacoronavirus, Porcine Endemic Diarrhea Virus, and Transmissible Gastroenteritis by RT-qPCR in Fecal Samples

Swine Deltacoronavirus (SDCoV) is a recently discovered virus and part of the newly recognized family of coronaviride. Deltacoronavirus, which is believed to have been introduced to the United States in 2014. Porcine endemic diarrhea virus (PEDV), a new alphacoronavirus, was discovered in the United States in 2013. This study took 52 swine fecal samples ranging from March 2007 to December 2014 to test for the presence of SDCoV and PEDV. Of these samples, four tested positive for PEDV and eleven tested positive for SDCoV. The data suggests that PEDV was introduced to Indiana in 2013, but data also suggests that SDCoV may have been in the United States prior to 2014. /

Life Science

Poster Number 24: Mariah Mobley

Root and Shoot Competition in Peas

When two plants are potted together they compete with each other for resources. These resources include, but are not limited to things such as water, nitrogen, and space. They compete with each other by altering their allocation of biomass, such as producing more roots or taller shoots. We hypothesize this competition is triggered by two factors: recognition of a different plant above ground and recognition of a different plant below ground. The trigger above ground is the red to far red light ratio. The trigger below ground has yet to be determined. We hypothesize if a plant is only allowed to interact with another plant in certain ways; above ground, below ground, or both, the plants will show unique signs of competition as the triggers are activated differently compared to plants that are not allowed to interact above

or below ground. Specifically we hypothesize: (1) Plants that only interact above ground should have more biomass above ground compared to the control; (2) Plants that only interact below ground should have more biomass below ground compared to the control; (3) Plants that interact above and below ground should have all around more biomass than the control. Along with these responses to competition we hypothesize that all of the treatments should have less fruit than the control as they are allocating biomass elsewhere. Our results will help us determine how plants recognize the presence of neighboring competitors.

Life Science

Poster Number 25: Alyssa West

Salmonella Biofilm Formation

This research looks at the formation of biofilms by various Salmonella serovars, including those involved in a recent outbreak of food-borne illness. Biofilm formation and attachment has been linked to bacteria being more virulent than normal. This was tested by culturing 20 different strains of Salmonella and letting them grow over the course of 1, 3, and 5 days. The optical density of the grown biofilms will measured at 600 nanometers after staining by crystal violet. Research so far has shown that certain strains of Salmonella are better biofilm-formers than others. Differences of growth at temperatures of 4, 21, and 37 degrees Celsius was also measured. Salmonella biofilms grew better at 21 degrees Celsius as compared to 4 degrees Celsius. Further research with these strains and other outbreak strains will need to be done to see what other conditions inhibit or promote Salmonella biofilm formation/

Life Science

Poster Number 26: Sarah Abercrombie

Seasonal Foraging by Forest Mice Enhances Loss of Weed Seeds from Crop Field Edges

Native seed predators, such as omnivorous mice (Peromyscus spp.) and ground beetles (Carabidae), consume weed seeds and waste grain within agricultural fields and thus provide a beneficial service to farmers. Seasonally resident species that migrate into fields from adjacent non-crop habitats may also contribute to loss of weed seed, particularly along field edges. We investigated whether rates of weed-seed removal within fields increased during summer crop growth when white-footed mice (Peromyscus leucopus), a ubiquitous forest-dwelling rodent in the eastern US, seasonally migrate into crop fields from adjacent forested woodlots. We used exclosure experiments to quantify the relative number of giant foxtail (Setaria faberi) seeds removed from seed trays by vertebrate and invertebrate seed predators within 4 cornfields in central Indiana. Each site was sampled during 4 different stages of crop growth (emergence,

vegetative, reproductive, post-harvest). We used negative binomial regression to quantify the effect of predator group (vertebrate or invertebrate), season, and distance from field edge on rate of seed removal. Vertebrates (mice) contributed nearly twice as much to seed removal (~50%) compared to invertebrates (~25%), irrespective of season. Rates of invertebrate consumption differed among seasons but were not affected by distance from forest-field edge. Rates of seed removal by mice significantly interacted with season and distance from field edge, with higher rates of seed loss near forest-field edges during July and August. Although non-crop habitats are often overlooked as a source of seed predation services, our results indicate that forest-dwelling white-footed mice likely subsidize rates of in-field predation on weed seed. Future investigations of seed-predation services should consider more holistically the role of resident and seasonally opportunistic seed predators in regulation of weed populations in crop fields.

Life Science

Poster Number 27: Yuezhen He

The use of a bioluminescence for the insitu monitoring of Listeria monocytogenes growth on produce

There has been a significant increase in the number of outbreaks of foodborne illness in recent years associated with fresh produce. The causative agents include Salmonella, Listeria monocytogenes, E.coli O157:H7, and non O157:H7 shiga toxin producing strains. Outbreaks related to Listeria monocytogenes have been associated with a myriad of food matrices including cheeses, ice cream, soy products, and ready to eat foods. However, recently there have been multistate outbreaks linked with cantaloupe and leafy greens resulting in serious illness and deaths. Proper temperature control during food production, distribution and storage (including the home) is important to limit growth of Listeria. In this study bioluminescence was used to examine growth (in situ) of internalized Listeria in romaine lettuce and on cut cantaloupe surfaces. The bioluminescent strain was used in growth curves in which luminescence was correlated with growth on lettuce and cantaloupe extracts. In situ light detection was accomplished using a black Delrin housing fitted with a Hammamatsu PMT sensor module with an embedded microcontroller interfaced with a computer. Growth curves showed a linear correlation between optical density and light for both lettuce (R^2 0.985) and cantaloupe (R^2 0.981) extracts. Surface growth on cantaloupe slice showed a long lag period followed by a constant increase in luminescence of approximately 27 photons per second. The results show promise in using this methodology for the in situ monitoring of growth of Listeria monocytogenes providing insight to better understand the risk of temperature abuse on fresh produce.

Life Science

Poster Number 28: Siyuan Sheng

The use of a bioluminescent Escherichia coli for real time monitoring of microbial inactivation by reactive gas species.

Gaseous sanitizers for inactivation of detrimental microorganisms associated with food production have been utilized extensively including Ozone and ClO2. Recently the use of atmospheric cold plasma to generate reactive gas species (ozone) has shown great promise since it can be used to inactivate microorganisms in a post processing treatment. The recent multistate Listeria outbreak associated with packaged salad highlights the potential of this application. However information on the kinetics of inactivation are limited. To determine inactivation insitu a bioluminescent strain of E. coli was with a Hammamatsu PMT sensor module containing an embedded microcontroller within a black Delrin housing constructed allowing gas pentation and sequestering ambient light. Preliminary experiments streaming air from a UV based ozone generator into an aqueous solution containing the luminescent E. coli. Loss of luminescence was related to cell concentration. Higher cell concentrations exhibited an immediate decrease in luminesce (4600 photons/sec) upon exposure however when ozone addition was stopped luminescence recovered at approximately 25% of the rate (1200photons/sec) of decrease. Aqueous chlorine dioxide showed a similar effect except the decrease and increase in luminescence were much faster. Initially the housing was placed in a cylinder with parallel electrodes to generate plasma and was problematic due to light generated in the housing (200,000 photons). The light generation is problematic as it limits the analysis of low cell concentrations. The test system is currently being modified to minimize the effect. /

Life Science

Poster Number 29: Tiffany Wineinger

Tickling rats improves some unfamiliar human-animal interactions

Title: Tickling rats improves some unfamiliar human-animal interactions / Authors: Tiffany B. Wineinger, Megan R. LaFollette, Brianna N. Gaskill / Introduction. Pet store rats often experience inconsistent and unfamiliar human interactions which increases fear. Tickling is a human-rat interaction that decreases fear and improves welfare by mimicking rat rough-and-tumble play. Some rats enjoy tickling more, as shown by emitting more positive vocalizations (high-callers) than other rats (low-callers). We hypothesized that tickling would improve human-animal interactions, especially in high-callers, compared to controls (minimal, standard handling) or low-callers. / Methods. We sampled 36 female rats across two replicates. One

researcher tickled 12 of the rats for 3 days (5 min/rat/day) while the other 6 rats were randomly assigned as minimally handled controls. The 12 rats were separated into two additional groups based on the total number of calls made during the 3 days: high-callers and low-callers. Store employees tickled the high- and low- callers for an additional 4 days (15 sec/rat/day). To determine ease of handling and fear of humans, we assessed the rats with an approach test, before and after, a 30s restraint. We analyzed data using one-way ANOVA and post-hoc Tukey-Kramer tests. / Results. High- and low-callers required fewer restraint attempts than control groups (p=0.02, p=0.03). During the approach test after restraint, low-callers took longer to make contact with an unfamiliar hand than high-callers (p=0.001) and controls (p=0.01). During both approach tests, low-callers had a shorter rearing duration than high-callers (p=0.03). / Conclusion. Tickling rats may improve ease of restraint, even with an unfamiliar handler. However, low-callers display more fearful and less exploratory behaviors. Therefore, high-callers may be most adaptable to a variety of unfamiliar human interactions. Overall, this study suggests that tickling improves human-rat interactions, especi

Life Science

Poster Number 30: Brittany Lotter

Using dried distiller's grains plus solubles in postpartum diets of beef cows: Impact on male progeny reproductive performance

Primiparous and multiparous Angus-Simmental cows (n = 20; BW = 705 kg ± 50.6; BCS = 5.3 ± 0.35) were used in a complete randomized block design to evaluate the effects of feeding dried distillers grains plus solubles (DDGS) as a primary source of dietary energy, during early lactation on; male offspring reproductive parameters. Cows were blocked by calf birth weight, calf sire and cow age and randomly assigned to one of two treatments: 1) silage–based total mixed ration (TMR; CON); 2) ad libitum baled corn stover and 6.8 kg/d supplemented DDGS (DDGS). All diets were formulated to be isocaloric and either meet, or exceed all other nutrient requirements (NRC, 2000). Postpartum ADG was targeted at .19 kg/d. Treatments were applied to the dam only through weaning, at which time bull calves were commingled and maintained on a diet formulated to meet or exceed all nutrient requirements for targeted gain (NRC, 2000). Weekly scrotal circumferences (SC) were taken, and semen collection by electroejaculation was done at 2-week intervals once SC reached 27 cm to determine attainment of puberty. Data were analyzed using the MIXED procedures of SAS. Final BW (394 kg; P = 0.06) and SC (33 cm; P = 0.30) determined at puberty were similar between treatments. Age at puberty was not different between treatments (P = 0.13). In conclusion, male progeny from dams fed high levels of DDGS did not show enhancements in reproductive efficiency in a manner previously observed in heifer progeny. /

Life Science

Poster Number 32: Sabrina Myoda, Chelsea Maupin

Purdue Student Farm

As demands on modern agriculture increase due to the rising global population, people all over the world are beginning to realize that global food systems are in dire need of change. The Purdue Student Farm Organization (PSFO) believes that small-scale, sustainable farms are an essential piece of the global food supply. Students within PSFO strive to increase their own and their community's knowledge and awareness of sustainable agriculture techniques. They hope to spread an understanding of the importance of sustainability in food systems through their engagement with the Purdue student body and in the Greater Lafayette area. / / The Purdue Student Farm functions as a living laboratory for small-scale agricultural education in a university and state whose agricultural focus tends toward larger-scale production. It offers a place where alternative techniques and perspectives can be investigated so that new opportunities in sustainable food and farming systems can be explored. By providing a venue for students to learn, the group is investing in the future of sustainable agriculture and fostering systems-based thinking about major agricultural challenges. The experiences and resources that are available through the Purdue Student Farm and facilitated by PSFO provide valuable hands-on learning within the many steps of farm-to-fork and local food production, as well as providing a venue for brainstorming the best ways to address sustainability in the food sector.

Life Science

Poster Number 177: Tatumn Vernon

Development of a Fish Transgenic Line for Use in Environmental Toxicology

Endocrine disrupting chemicals (EDCs) are commonly found in aquatic systems and have been shown to affect the reproductive development of many organisms, including fish. There is a need to develop bioassays that can detect the effects of EDCs in a sensitive and cost-effective manner. The long-term goal of this study is to develop a fish transgenic line that will produce embryos for the use in the detection of EDCs. The line targets a Japanese medaka ovarian structure protein (OSP1) through the attachment of the promoter region that drives the expression of the gene encoding OSP1. This promoter is linked to the upstream region of a green fluorescence protein (GFP) gene. GFP induces OSP1 expression allowing for the detection of estrogenic, anti-estrogenic, and/or androgenic EDC exposure. This is measured through the intensity of the GFP expression. My role in this project was to aid in the development of this transgenic line by undergoing genetic screenings on fish that had been microinjected with the genetic construct as well as the offspring of these microinjected fish. These genetic screenings

involved crude DNA extraction and digestion, polymerase chain reaction (PCR), and gel electrophoresis. This step was performed to check for the genetic integration of the construct and its ability to be transferred through the germline. /

Life Science

Poster Number 242: Yichen Que

Use of statistics to quantify the magnitude of errors in the sorting of pigs for marketing in three finishing barns

The objectives were to use actual data to evaluate methods to quantify the amount of error in the estimation of BW for market pigs and its impact on the mean and SD in carcass weight (CW) and sort loss. Data from three wean to finish barns were obtained which included harvest dates, CW, sort loss, date ractopamine feeding was initiated, and pigs' birth dates. Pigs were sold in three marketing cuts (MCUTs) with multiple marketing days for each MCUT. Each pig's BW was estimated from CW. The BW data were fitted to a Michaelis-Menten (GMM) equation with the values for K and C fixed at 191.5 d and 2.221, respectively. The BW for each pig at each marketing day was estimated using the GMM equation including each pig's random effect. Three marketing error rates for BW were evaluated: with no error, actual and random sorting. Statistics were calculated including: mean and SD for BW and CW, sort loss, and percentage of pigs sold correctly, for each MCUT. The overall barn means for CW were 95.7, 100.9 and 91.2, and SD's 7.6, 8.8 and 7.4 kg. With no error, the estimated means were 95.5, 100.7, and 91.0 kg with SD's of 4.6, 4.6 and 4.3 kg. Percentage of pigs sold correctly for the first two MCUTs were 56, 48 and 52% and difference in sort loss (estimated versus actual $/pig) were 1.22, 5.74 and 0.56 for each barn. The accuracy in which pigs were sorted for market can be evaluated from currently available data.

Mathematical/Computational Science

Poster Number 8: Katie Rosswurm

Effect of Calcium Chloride on the Formation of Zinc-Cellulose Complexes for Making Biodegradable Cellulose Film

Cellulose is the most abundant form of biomass on earth and is used for many products. However, cellulose is a highly crystalline polymer with a large molecular weight, and not many solvent systems can dissolve this polymer. $ZnCl_2$ solutions effectively dissolve cellulose, and the addition of $CaCl_2$ promotes solution gelling. The purpose of this study is to optimize the amount of calcium chloride in the Zn-cellulose solution to produce film with better tensile strength and translucence. Zn-cellulose complex solutions were prepared in the presence of

differing concentrations of CaCl2. The complex was cast onto a glass plate and coagulated in ethanol to leech out the salts. The film was washed with water and glycerin, air dried, and the resulting tensile strength of the film was measured along with the rheology of the Zn-cellulose complex. Results indicated that film with no CaCl2 was white in color and yielded a tensile strength of 21.7 KN/m2. The addition of CaCl2 yields a transparent film; the tensile strength was increased 69.4 KN/m2 (Ca: Zn= 0.03 molar ratio) and 88.2 KN/m2 (Ca: Zn= 0.06 molar ratio) respectively. Rheology results indicate a nearly 3-fold increase in viscosity of the Zn-cellulose complex with the addition of CaCl2 increasing from 1300 cps to 3100 cps. Overall, solubilizing cellulose is critical to meet the needs of cellulose based biodegradable products. The addition of CaCl2 aids in the formation of sturdy and transparent films with high potential in pharmaceutical, food, and non-food applications.

Physical Science

Poster Number 20: Kelsey Morris

Pasting properties of starch:water:sweetener systems relevant for reduced sugar applications in low-moisture baked goods

Industry trends are shifting toward products that contain less sugar; however, technical challenges in reducing sugar while maintaining desirable quality attributes must be overcome. The structure and texture in low-moisture baked products results from an interaction between dough components, where sucrose, in addition to being sweet also inhibits gluten development, delays starch gelatinization, and strongly affects texture. When considering alternate sweeteners for baked products, their effects on starch thermal properties must be known. / / The objective of this study was to characterize the effects of sweetener type on the / pasting properties of starch:water:sweetener systems. / / Wheat flour/starch and a variety of sweeteners (sucrose, glucose, lactose, fructose, polydextrose, maltodextrins, inulin, isomalt, and other sugar alcohols) were studied. Thermal properties of the starch in the presence of saturated or highly concentrated sweetener solutions were determined using a rapid visco analyzer (RVA). Results were correlated with the physical properties of the sweeteners. Additionally, polarized light microscopy was used to verify whether or not starch pasting actually occurred by looking for the presence of intact starch granules before and after the sample was run in the RVA. / / Sweetener type had a significant effect on starch thermal properties. The molecular weight of the sweetener was correlated to on the pasting curve, with values up to 8x greater for monosaccharides than polysaccharide sweeteners. The highest onset and peak temperatures for starch gelatinization occurred in the presence of sucrose, fructose, glucose, and inulin. / / These results provide relevant information for reformulation strategies in reduced sugar applications. / /

Physical Science

Poster Number 31: Sarah Correll

What Factors Determine High School Graduation and College-Going Rates in Indiana?

Secondary and postsecondary educational success is becoming increasingly important to the state and national workforce and economy. High school graduation is a requisite for nearly all jobs, and it is projected that 503,000 of the 930,000 job vacancies in the United States in 2018 will require a postsecondary credential (Bureau of Labor Statistics, 2010). This research analyzed the most commonly tested graduation rate independent variables and applied them to both Indiana's high school graduation rates and the college enrollment rates of these graduating seniors at the school corporation level. Data describing the graduating class of 2013 from 283 Indiana public school corporations were gathered from the Indiana Department of Education, Indiana Commission for Higher Education, Indiana Office of Management and Budget, and United States Census Bureau. These data included the average annual expenditures school districts made per student, teacher experience, attendance and discipline rates, ratio of students receiving free and reduced lunch and special education, and education attainment levels of the surrounding communities. Using a least squares regression in Microsoft Excel, it was found that the most significant variables were percent free and reduced lunch (negative coefficient), percent expelled in the buildings (negative coefficient), and ratio of instruction delivered through vocational education (positive coefficient). This is consistent with the current body of knowledge in the field, as much of the variation in high school graduation rates is attributed to socioeconomic, not academic or funding, variables. These findings indicate a need for further research in socioeconomic factors impacting specifically high school students' homes, student engagement in the classroom and in extracurricular activities, and data at the classroom and building levels.

College of Education

Social Science/Humanities

Poster Number 33: Olivia Schindler

Teacher Evaluations

In response to federal accountability requirements, states across the nation are implementing teacher evaluation systems that mandate observations of teachers' instructional practices. Typically, the number of required formal observations ranges from one to three. However, there is no evidence to support that this number of observations is sufficient to accurately

reflect the practices of all teachers, regardless of their tenure in the teaching profession. Therefore, in this study, I examine whether the reliable documentation of new and veteran teachers' practices can be achieved with the same number of observations. / / Specifically, I will use a single-case methodology to investigate the stability of three different kindergarten teachers' practices -- one first year teacher, one teacher with 3-5 years of experience, and one veteran teacher. I focus on Language Arts, a key content area in the early grades of school, and use the Early Language and Literacy Classroom Observation (ELLCO) measure, a grade and content specific measure, to evaluate each teacher's lessons. I control for variability in instruction that may be present at the start of the school year by observing and coding three phonics lessons taught by each teacher in the second semester of kindergarten. /

College of Engineering

Social Science/Humanities

Poster Number 35: Qianru Jia

3D Printing Nanostructured Thermoelectrical Device

Thermoelectric materials can convert thermal energy to electrical energy and vice versa. They have attracted much attention and research efforts due to the possibility of thermoelectric materials solving electronic cooling problem and reducing energy consumption through waste heat recovery applications. The efficiency of a thermoelectric material is determined by the dimensionless figure of merit (ZT). Researchers have worked for several decades to improve the ZT, but there had been little progress until nanomaterials and nanofabrication became widely available. Nanotechnology makes ZT enhancement possible by disconnecting the link between thermal and electrical transport. Enabling printed, customized thermoelectric devices and understanding the impact of structure on performance contributes to further improvement of energy saving solution. This study combines nanostructured materials with 3D printing technology to enable customized thermoelectric device with mechanical flexibility. A 3D printer is fabricated to allow printing with nanostructured thermoelectric inks and can print customized device by controlling the movement of the printing plate as well as the dispensing of the inks. Although the characterization of the nanostructured devices by the modified Harman method yields low figures of merit, this work demonstrates the feasibility of using 3D printing to fabricate flexible thermoelectric devices. This technology will contribute to ongoing research of energy harvesting through waste heat recovery.

Innovative Technology/Entrepreneurship/Design

Poster Number 38: Riley Barta

Application of Viper Expansion Device in Transcritical Carbon Dioxide Refrigeration Cycle

In light of recent trends towards energy efficiency and environmental consciousness, the heating, ventilation, air conditioning and refrigeration (HVAC&R) industry has been pushing for technological developments to meet both of these needs. As such, several solutions for harnessing the energy released from refrigerants in the free expansion process have been developed to increase overall cycle efficiency. Additionally, the implementation of natural refrigerants with reduced Global Warming Potential (GWP) in refrigeration cycles has become increasingly important since current refrigerants are ozone depleting or linked with climate change. This research will focus on the natural refrigerant carbon dioxide (CO2) due to its GWP being 1 and significant potential for energy recovery due to its high operating pressures. The goal is to investigate the potential impact of installing an energy recovery expansion device, known as the Viper Expander, into a transcritical CO2 refrigeration cycle. The Viper was developed by Regal Beloit Corporation and operates by using a nozzle to accelerate the high pressure CO2 into a high velocity jet of fluid impinging on a micro-turbine impeller. The impeller is coupled with a generator which harvests the kinetic energy of the CO2 by converting it into electrical energy that can be fed back into one of the system components, like a fan or compressor motor. The feasibility of this application was analyzed through modeling the unit's potential test stand for concept validation, and resulted in a model prediction of the Viper harvesting up to 300W at certain operating conditions. Future work will be physically testing the Viper in this test stand to validate the model and potentially offer a solution to both increased cycle efficiency and utilization of CO2 as the natural refrigerant.

Innovative Technology/Entrepreneurship/Design

Poster Number 39: Rachel Rahn

Assessment of Processing Conditions in Organic Field-Effect Transistors

Polymer-based organic field-effect transistors (OFETs) have attracted considerable attention because they enable low-cost fabrication, solution-processing, and potentially disposable flexible organic electronic devices. Processing conditions play a critical role in thin film formation and device performance. In this study, an empirical analysis tool called Process Scout developed by Genemetrix was applied to assess the processing factors including spin coating velocity and annealing temperatures in the fabrication of DPP-0 and DPP-TT (Diketopyrrolopyrrole) based OFETs. This created a realistic model because common variance was not assumed and nominal and numeric variables could be analyzed simultaneously. The

developed process may be applied to expand the study of other organic semiconductors, as well as minimize cost, time, and materials for fabrication. The emerged process is the first step in creating a standard fabrication protocol, allowing organic field-effect transistors to flourish. /

Innovative Technology/Entrepreneurship/Design

Poster Number 40: Nathaniel Kallmyer

Biofuel from Spent Coffee Grounds

As supplies of fossil fuels are depleted, the need for alternative sources of fuel becomes evident. Biodiesel is an attractive alternative to petroleum-based fuel; however, the cost of the feedstock, mainly vegetable oils, makes biodiesel production an expensive process. In the search for alternative feedstocks, spent coffee grounds (SCG) were revealed to be a largely available and economical source of vegetable oil. The drying of SCG, extraction of vegetable oil, and conversion of this oil by trans-esterification to biodiesel were studied. SCG were dried in a tray drier. Extractions were performed using hexane as solvent in a Soxhlet extractor. Reactions were performed in this solvent using inorganic and enzymatic catalysts and either methanol or ethanol as a reactant. After selection of immobilized lipase as the catalyst, kinetic tests were performed in a packed bed reactor. Extraction tests revealed approximately 14% dry-mass oil yield from SCG, and reactions revealed that conversion up to 50% was possible using either soluble or insoluble enzymes. Results from kinetics testing significantly diverged from the Michaelis-Menten model, suggesting need for a more complex kinetic model.

Innovative Technology/Entrepreneurship/Design

Poster Number 48: Jee Hwan Park

Development of a Robotic Water and Sediment Sampling System

Water and sediment sampling is one of the most important tasks in maintaining a clean and safe environment. Currently, water and sediment sampling is mostly based on human activities. However, it is possible to reduce the risk of human sampling by using a robotic sampler with an autonomous collecting system. Therefore, the main goal of this research project is to design an autonomous robotic system for water and sediment sampling for various water environments such as rivers, ponds and seas. / To build autonomous robotic system, two feedback motor control systems are embedded. The Ffirst system is to sample water and sediment under water. The system includes feedback of the hall effect sensor that measures RPM and a high torque motor. Second system is implemented on buoy. Three proximity sensors provide feedback to the motor to the system to control the position of the robot under water. The second system is to manage the first system on a buoy. / Next stage is to design a sampling robot with a self-

positioning system. Accelerometers or tilt sensors can be used to provide the a gradient of the robot position. With such provided feedback, propellers or a water pumps can be used to position the prototype precisely. /

Innovative Technology/Entrepreneurship/Design

Poster Number 50: Neal Cardoza, Shu Yi Neoh

Dry autoclaving for Graphene-sulfur Cathode of Li-S Batteries

There is an increasing demand for longer-lasting and higher-performing energy storage devices. The low specific capacity and energy density of today's rechargeable lithium-ion battery hinders their application in emerging technologies. In contrast, the higher capacity and energy density of the lithium-sulfur battery can enable the next-generation of grid energy systems and longer-lasting electronics. However, low conductivity and the polysulfide shuttle mechanism, where Li2Sx (x=1-8) species are created and freely move between the electrodes, preventing industrial applications of the Li-S battery. / To address these issues, this work introduces a carbon-sulfur composite created via dry autoclave synthesis using a step-wise heating profile. This method increases the overall capacity of the composite through greater interfacial contact between sulfur and carbon. To further reduce the migration of polysulfides from the cathode, a carbonaceous barrier is introduced into the lithium-sulfur battery. The carbon barrier, synthesized via electro-spinning, exhibits nanosize diameter and required porosity that effectively restrains polysulfides at the cathode while permitting the passage of lithium ions. The demonstrated composite has shown an initial capacity of 1632 mAhg-1, a value approaching the theoretical capacity of 1672 mAhg-1 of sulfur. X-ray powder diffraction confirms the presence of graphene and orthorhombic cyclosulfur. Thermogravimetric analysis demonstrates a mass loading of sulfur of ~40%-wt. in the composite.. /

Innovative Technology/Entrepreneurship/Design

Poster Number 52: Nam-Anh Nguyen

Efficient biofuel production through microbial electrosynthesis

Climate change is a serious environmental problem caused by fossil fuel consumption that releases large amount of CO2 to the atmosphere. Existing renewable energy sources, such as algal biofuels, are promising but relatively costly, which is largely due to the high extraction costs of biomass. In this study, we evaluated microbial electrosynthesis with bacteria to reduce CO2 to higher carbon organic compounds. We use Sporomusa ovata, an acetogenic bacterium, to convert CO2 to acetate initially and further tested its potentials to produce other higher alcohols in a microbial electrolysis cell. A membrane-less single-chamber reactor was used for

the experiments. Liquid and gaseous samples were collected from the reactor and the concentrations of acetate and CO2 were measured. Alternative reactor design was also evaluated to improve acetate production efficiency. Further, different types of acetate-utilizing bacteria to produce butanol are being evaluated. This research opens the possibility in directly producing biofuels from CO2 as the sole carbon source and electricity as the sole energy source without the expensive biomass extraction costs.

Innovative Technology/Entrepreneurship/Design

Poster Number 54: Yichen Zhong, Lakshya Garg, Muhamad Hafiz Hussin

Evaluation of Functionality and appropriateness of a Cloud-based solution for Purdue online Map-based Decision-support systems

The ABE Department created a map-based decision support system designed to display the locations of water quality monitoring stations across Indiana. The Indiana Water Monitoring Inventory Map compiles locations from dozens of agencies measuring many different types of analyzes, from chemistry to habitat. Computationally this site is a spatial database, a web server and an open-source REST and SOAP engine to stream data from the database to a mapping interface. The software is stored on campus in the ITAP virtual server cluster. This includes a Windows operating system, and scripting languages like Python and PhP and JavaScript. IT situation requires ABE provide upgrades, maintenance, and 24/7 oversight and ABE is investigation cloud-based solutions to improve this situation. This project will evaluate the appropriateness, ease of use, and functionality of a particular cloud-based solution for a mash-up combining water quality data from the EPA WQX database with a REST-based stream of data from the ABE server. A successful mash-up will effectively double the amount of data present on the map. A particularly successful mash-up will include the ability to filter the incoming WQX data from the EPA servers in order to select particular kinds of samples.

Innovative Technology/Entrepreneurship/Design

Poster Number 56: Zachary McCrea, Austin Cannella, Mena Elmalh

FrenchFry DNA Annotation

Through the isolation of a novel phage, a genomic DNA sequence was founded. Through this DNA sequence, researchers have used novel programs like DNA Master, Phamerator, and Starterator to determine start sites and qualities of individual genes. Throughout the process, many different things have been analyzed and discovered, like deletions of certain genes and violations of the overall guiding principles for annotation.

Innovative Technology/Entrepreneurship/Design

Poster Number 57: Javieradrian Ruiz

In Situ Thermal Testing of Materials for Passive Thermal Management

The research is on the use of phase change materials on android cell phone processors. We are researching how affectively we can harness the latent heat of the phase change material, in order to dissipate unwanted heat produced by the processor when the cell phone is running.

Innovative Technology/Entrepreneurship/Design

Poster Number 60: Jenny Ly, Greg Bandy, Abby Hunnicutt, James Wang

Isolation, Characterization and Analysis of Grand2040, a Novel Cluster B1 Mycobacteriophage

Phages from diverse clusters were selected for annotation based upon large differences in genome size and diverse putative proteins towards the long term goal of further exploring changes in protein expression in response to changes in the lifecycle of the host bacteria. Annotation of our specific gene, Grand2040, was executed using bioinformatics programs including DNA Master, Glimmer, GeneMark, Phamerator, Starterator, and BLAST. ORFs were assigned a predicted function based on homology to previously characterized proteins, location in the genome, or the presence of conserved protein motifs.

Innovative Technology/Entrepreneurship/Design

Poster Number 69: Eric Rohrbach

Polysuflone Reverse Osmosis Membranes Prepared through Phase Inversion

Developing anti-fouling and degradation resistance reverse osmosis membranes will help combat water scarcity. Polysulfone (PSf) and water soluble polyethylene glycol (PEG) solutions are casted and immersed in water, allowing phase inversion to occur. This technique will be utilized to disperse nanoparticles evenly in the film, potentially improving the film's resistance to fouling and degradation. These membranes will be tested in a a cross flow system to determine salt rejection and pure water flux properties. /

Innovative Technology/Entrepreneurship/Design

Poster Number 71: Unmesha Kale

Problem Framing as a Path to Innovation

The data for problem framing that has been collected will be analyzed for a pattern recognition. Any co-relation between individual and group behaviors for processing ideas and designs will be evaluated in the course of research that is performed . Furthermore characteristics that determine the approval of various ideas will also be studied.Various background information such as gender etc will be analyzed to come to necessary conclusions. (This is an ongoing research thus no results have yet been formulated. This is the objective abstract of this research)

Innovative Technology/Entrepreneurship/Design

Poster Number 72: Shu Yi Neoh

Promising Li2S-Carbon Spheres Composite Cathode for Lithium-Sulfur Batteries

The energy and energy storage demands of today's society are at an all-time high, and will continue to grow as technology develops. The high theoretical specific capacity (1672 mAh/g) and high specific energy (2600 Wh/kg) of lithium-sulfur batteries can make emerging technologies, such as the electric vehicle, a reality. However, lithium-sulfur batteries have yet to enter the commercial marketplace due to performance problems at the research level. The major issue is the polysulfide shuttle effect, in which the chemical intermediates formed in the battery causes several problems, including increased impedance, anode passivation, and severe capacity fading within the first few discharge cycles. / To overcome this problem, this project focuses on trapping Li2S particles within amorphous carbon spheres to increase conductivity and reduce dissolved polysulfide loss. To create perfectly spherical carbon substrates for lithium sulfide, the industry-scalable process of sonochemistry was utilized. This technique uses ultrasonic waves to induce high pressure (1000 kPa) and temperature (4000K) to rapidly create cross-linked, spherical particles in less than 10 minutes. X-ray powder diffraction confirms the presence of both amorphous carbon and lithium sulfide. Thermogravimetric analysis reveals ~20 %-wt. of lithium sulfide in the composite. Electrochemical studies and material optimization of Li2S-Carbon spheres cathode composite material will be demonstrated. /

Innovative Technology/Entrepreneurship/Design

Poster Number 75: Jinwon Park

Role of IE/HFE methods for improving microsurgery training

Currently, the training in microsurgery is largely based on surgical trainees learning from senior surgeons or through simulation training with low fidelity models, e.g., silicon tubings, turkey leg, mouse model, etc.. To better prepare residents technically and cognitively for the complexities encountered during live surgeries and to ensure patient safety, systematic and higher fidelity microsurgery training is needed. Creating such training requires analysis and improvement human factors engineering. Improvement in time studies, workspace, task analysis, and work physiology will guide the trainees to more safer and efficient training in microsurgery. / Microsurgery is a surgery requiring an operating microscope. Generally, residents train in an ideal environment, placing a mouse-model on a flat board free of equipment constraints, patient anthropometry, etc. Real microsurgery, however, can come in more complex environment including tilted and larger subject, and deeper incision point. Working closely with clinical collaborators from Mayo Clinic and using human factors methods such as posture analysis (constraints of the operating room environment vs. simulation environment), task analysis (analysis of how task is processed) and time studies (how much time it takes for each task), our team design several parts with Computer Aided Design that will provide more realistic environment. / Providing as much complex and various situation as possible was the key challenge observed between real procedure and training. From the help of new technologies such as 3D printing and 3D displays, more environment can be created to improve microsurgery training. /

Innovative Technology/Entrepreneurship/Design

Poster Number 79: Chulgi Nate Hong

Synergetic Lithium Alloying and Pseudocapacitive Lithium-ion Storage in Hierarchical Co/CoO/C Hybrid Anodes

A hierarchical unique architecture comprising a mixture of ~20 nm metallic cobalt and cobalt monoxide nanoparticles in situ decorated on the porous carbon substrate in one-pot thermal reaction forming an electrochemically active hybrid anode (Co/CoO/C) electrode is developed. Ultrafast Li-ion storage is observed in hybrid Co/CoO/C anode because of synergetic alloying mechanism and pseudocapacitive surface storage on the interfaces. Very high reversible discharge capacity of 1100 mAh/g is achieved from the hybrid anode at a current density of 0.1C, which is higher than the theoretical capacity of Co3O4 (890 mAh/g). Even at a very high rate of 20C (6 A/g), Co/CoO/C hybrid electrode demonstrated a specific capacity of 302 mAh/g

with 98.2% of capacity retention after 100 galvanostatic cycles. Anchoring of cobalt and cobalt oxide nanoparticles on carbon support eliminated the particle agglomeration and loss of electronic contact during electrochemical cycling eliminating previously reported drawback of capacity fading during long term cycling.

Innovative Technology/Entrepreneurship/Design

Poster Number 84: Tianran Liu

Thermophotovoltaic Direct Thermal Emission Measurement

Thermophotovoltaics (TPV) systems convert heat into electricity via thermal radiation. The efficiency of the TPV system is the ratio of the electrical power generated from the photovoltaics (PV) diode to the emitted thermal power form the emitter. In many TPV experiments, huge losses from the heating stage makes it extremely hard to quantify this efficiency by measuring the electrical input and output power. Therefore, directly measuring the thermal emission from the emitter becomes a critical step in TPV experiments to determine the performance benefits associated with certain improvements. In a direct thermal emission measurement (DTEM) setup, a metallic waveguide collects the emission from the emitter and guides it through the viewports towards the sensor. The setup is validated and calibrated at high emitter temperatures. Real time emitter temperature measurement is performed to calibrate the DTEM measurements at different temperatures. Two non-idealities, the heat shield thermal emission and the temperature dependent reflectance of aluminum, are found to be the major causes of errors in calibration. To alleviate the impact from the non-idealities, a double heat shield design is proposed to control the heat shield emission and passive cooling through thermal conduction is applied to the metallic waveguide.

Innovative Technology/Entrepreneurship/Design

Poster Number 88: Forrest Son

Variable Speed Heat Pump Performance Analysis

The purpose of this research is to conduct level 1 unitary split-system performance tests of a variable speed heat-pump. The tests follow the ARI 210/240 standards for variable speed compressors. In addition to the level 1 tests, the 2nd stage heat control algorithm, fault detection and diagnostic, FDD, system with low refrigerant charge error, and demand response operation is demonstrated. Temperature and humidity controlled psychrometric chambers, at Herrick Laboratories, are used to satisfy the standard SEER and HSPF rating operating conditions. These chambers are rated following ASHRAE standards. The outcomes of this

research are a verification of the performance of the variable speed heat-pump, and an increased understanding of variable speed heat-pump's capabilities.

Innovative Technology/Entrepreneurship/Design

Poster Number 34: Xiaohong Tan

Extracellular Matrix Composition and Biophysical Properties Guide Epithelial to Mesenchymal Transition and Drug Sensitivity in Three Dimensional In Vitro Model of Pancreatic Cancer

Epithelial to mesenchymal transition (EMT), thought to be the first step in cancer metastasis, is a process by which cells invade through the basement membrane into the interstitial extracellular matrix (ECM) and switch phenotype. Understanding the role of ECM mechanobiology in this process is incomplete and current preclinical cancer models are limited in their ability to study these tumor-stroma interactions. In the present study, we aimed to define how ECM type and physical properties modulate EMT phenotype and associated drug sensitivity. Drug dosing experiments with gemcitabine, the current standard of care for pancreatic cancer, were performed. Three pancreatic cancer cell lines, which differ in their EMT phenotype, were cultured within 3D collagen-fibril matrices prepared at varied fibril densities with type I collagen oligomers. For comparison, parallel experiments were conducted in Matrigel, a tumor-extracted basement membrane gel. Cells were also characterized based on morphology and EMT protein expression (i.e., vimentin and E-cadherin). While type I collagen maintained mesenchymal morphology and phenotype, Matrigel consistently down regulated these properties in the cell lines tested. At matched stiffness in Matrigel and type I collagen, the epithelial cells showed similar drug sensitivity while the more mesenchymal cells appear to have decreased sensitivity in collagen. When matrix stiffness is increased by increasing fibril density, the epithelial cells become more sensitive while the mesenchymal cells are less sensitive. Altogether, these results demonstrate the important role that the fibril microstructure plays in cancer EMT and drug resistance. Further elucidating the mechanisms of tumor-stroma mechanobiology will help guide the development of improved preclinical models of cancer to ultimately improve clinical outcomes.

Life Science

Poster Number 37: Joon Hong Kim

Application of Infusion Pump Informatics to Quantify Workflow and Gaps in Human Factors

Infusion pumps are medical devices that deliver medication, fluids, and nutrients in a precise, timely, and controlled manner that is critical to patient care(1, 2). These devices are found ubiquitously across the healthcare system, ranging from operating rooms and clinics to in-home

patient use. Although they often provide critical and often-times life-saving care to patients for illnesses that span the range from dehydration to cancer treatments, these devices are also a frequent source of patient harm. / The Institute of Medicine (IOM) estimates that at least 1.5 million preventable adverse drug events (ADE) occur in the United States alone (3). Wrong medication, overdose, underdose etc. result in significant costs not just to health institutions, but to the patients and families and have impacts throughout the health care system, e.g., insurance and providers (3, 4). Innovations in medication delivery systems have led to the increasing adoption of "smart" infusion pumps that inform users of input errors (e.g., order of magnitude drug dose error), errors in operation (e.g., occlusion in intravenous lines), and outdated drug libraries (5). However, the potential of smart infusion pumps is limited by barriers and gaps in usability (e.g., cumbersome menus, input errors, and user-experience) and workflow efficiency (e.g., steps needed to program devices and overcome warnings). / This presentation aims to quantify temporally the normal and abnormal states (and the resolution of abnormal states) of smart infusion pumps during clinical use and investigate the implications of this data on patient safety, workflow, and human factors. The long term goal of this research is to improve the usability design and application of smart infusion pumps in a complex, high-workload health service delivery system. /

Life Science

Poster Number 41: Ethan Titus, Emily Coleman, Danish Ghazali, Sarah Cryer

Capture and Analysis of Novel Bacteriophage Genome

Capture and Analysis of Novel Bacteriophage Genome / / By: Mohammed Danish Ghazali, Emily Coleman, Ethan Titus, Sarah Cryer / / Bacteriophage are the most abundant organisms ever discovered. These prokaryotic viruses specialize in attacking and infecting bacteria. Gaining a better understanding of bacteriophage allows researchers to gain a better understanding of the core concepts of molecular biology as a whole. Uncovering the relationships between different species of bacteriophage enables us to determine ways to harness the power of the most abundant type of organism on Earth in order to devise new uses for molecular biology. In our project, we set out to capture, cultivate, isolate, sequence and analyze the genome of a novel bacteriophage. A small team collected soil samples and exposed the hidden bacteriophage to the M. smegmatis bacteria that they infected in order to cultivate a larger sample. Once the team determined that a single species of bacteriophage was growing in isolation from any other contaminants, they were able to extract a sample of DNA and send it off to be sequenced. Upon receiving the results of sequencing, a new team set out on the task of analyzing the phage's genome using specific bio-informatics software designed for bacteriophage research. The team analyzed each gene individually and checked them against bacteriophage that were determined to be very genetically similar. Once the team was satisfied that the genes were in the correct

places and order, they set out to determine the functions of each of the genes. Given the relatively small portion of the population of bacteriophage that have been discovered, it is highly likely that the bacteriophage isolated in this project has never been analyzed before and there is a high potential that the genes found within the phage have functions never before seen. /

Life Science

Poster Number 51: Matous Becker

Effectiveness Spectra for Solar Ultraviolet Disinfection

According to the United Nations, nearly 800 million people (or 11% of the world's population) lack access to an improved drinking water source. Water from unimproved sources can contain harmful pathogens, and over 2,000 children die every day due to lack of clean water, mainly in developing countries. One approach to treating drinking water has been to add chlorine, but it can be difficult to administer the proper dose, and harmful byproducts can be produced. Another approach is to use solar ultraviolet light (which is abundant in many of the areas that lack clean water) to deactivate the pathogens. The purpose of this research project has been to better understand solar UV disinfection by developing effectiveness spectra for several key microorganisms. Once the spectra are completed, we will know how much each wavelength of light contributes to disinfection, and will be able to design more efficient disinfection processes. Samples of the strains Salmonella typhi LT2, Vibrio harveyi, and Cryptosporidium parvum were exposed to wavelengths of light ranging from 254 nm to 330 nm using a polychromatic, medium-pressure Lamp, and deactivation was tracked as a function of dose. It is well-documented that as wavelength increases above 254 nm, the disinfection becomes exponentially less effective, and the data from this project has maintained this trend. When these results were paired with data on how much UV light of each wavelength reaches earth from the sun, it was found that wavelengths between 300 and 310 nm are the largest contributors to disinfection.

Life Science

Poster Number 59: Giulia Olivieri, Colleen Falk, Shristi Jaganmohan

Isolation of a Novel Mycobacteriophage and Analyzation of its Genome

There are millions upon millions of mycobacteriophages in the world, all of which have the potential to create new biotechnology. However, in order for this to happen, theses mycobacteriophages, also known as phages for short, must be discovered, through isolation and manipulation techniques, and researched, through the analyzation of their genomes.

Although many mycobacteriophages have already been found and researched, there are many more phages yet to be discovered and explored, all of which have the potential to make changes in the field of biotechnology. Using aseptic laboratory techniques, we isolated phages from soil samples, purified them, performed electron microscopy, and isolated the viruses' DNA. The genomes were then sequenced and analyzed. This analyzation included the use of an algorithm to define potential genes, assign putative functions, and determine the order in which they appear in the genome. These results will help contribute to scientific literature and public databases, which will help future scientists perform their own research by comparing their own mycobaceriophages to ours.

Life Science

Poster Number 61: Megha Manjunath, Zach Roberts, Srishti Sharma, Pei Yang

IT 227 Final Presentation

Presenting on gene Cosmolli16 annotated by this team.

Life Science

Poster Number 68: Gregory Berglund

Paper Detection of Isothermal Pathogenic Nucleic Acid Amplification Using pH Indicator Dyes.

Neonatal sepsis is responsible for nearly one-fourth of neonatal deaths globally. Current diagnostic protocols for neonatal sepsis involve blood culture, which requires at least a full day of incubation and is infrastructure and training intensive. A low-cost, rapid diagnostic device is needed to diagnose neonatal sepsis in low-resource settings at the point-of-care. Here we present a method of amplifying pathogenic nucleic acid isothermally for visual, colorimetric detection on paper. Detection of nucleic acids by the loop-mediated-isothermal amplification (LAMP) method typically requires fluorescent monitoring or post-reaction electrophoresis with equipment inaccessible at the bedside. Alternatively, monitoring the pH change of an amplification reaction by pH-sensitive dyes and paper offers immediate sample analysis without specialized and expensive equipment. This method will be ultimately applied to the detection of E. coli, Strep B, and K. pneumonia, the most common bacterial causes of neonatal sepsis.

Life Science

Poster Number 87: Joon Hon Kim

Utilizing Infusion Pump Informatics to Quantify to Temporal Workflow and Identify Gaps in Human Factors

The purpose of this presentation is to quantify temporally the normal and abnormal states (and the resolution of abnormal states) of smart infusion pumps during clinical use with infusion pump informatics(IPI) and investigate the implications of this data on patient safety, workflow, and human factors. The long term goal of this research is to improve the usability design and application of smart infusion pumps in a complex, high-workload health service delivery system.

Life Science

Poster Number 49: Siyu Liu

Development of Sleep Quality Measures from Wrist-Worn Wearables Data

With the trend of personalized health monitoring and the quantified self movement, wearable devices are providing data about a large population of users. Currently, most sleep performance measures of wearables data are focusing only on the duration of sleep, whereas this research focused more on the sleep quality. By computing weighted score considering different sleep depth, rather than only quantity, and also applying different penalty based on the time when people awake during the sleep. During this research, database and other coding tools were utilized to manage data and demonstrate results through multiple forms. This research utilized data from Hawaii Space Exploration Analog and Simulation (HI-SEAS), simulated Mars missions on the slopes of Mauna Loa volcano in Hawaii, in which crews of six “Astronaut-like” individuals are immersed in” Mars-like” terrain in Hawaii for 4-, 8-, and 12-month missions collecting a large amount of data about their behavioral health over time.

Mathematical/Computational Science

Poster Number 58: Lucas Robinson

Interactive Computer Aided Design of Electrochemical Systems

The most popular and widely used rechargeable battery numerical model, the dualfoil, was developed in fortran by John Newman and coworkers 1-3, and enables the user to describe the time-dependent electrochemical transport of lithium and charge, through the application of concentrated solution theory in porous media. Such a model has enabled the design of many advanced lithium-ion batteries for hybrid and plug-in electric vehicles that can operate under high current densities. Historically, however, the dualfoil and other subsequently derived

models are cumbersome and unwieldy when used, and offer limited flexibility regarding parameter variability, integration into more sophisticated numerical descriptions, coupling to multiscale formulations, or the simple visualization of generated data. The nature of dualfoil makes it difficult to use, and it does not allow for systematic parametric analyses, or direct integration into high performing, multiscale numerical frameworks. This work introduces a proof of concept for a flexible application programming interface, dualfoil.py, that enables hierarchical control over the dualfoil legacy code and visualization modules, and provides the user with the ability to rapidly set up complex, multiscale simulations. Furthermore, the program features a GUI-mode for single-run simulations, and a powerful text-mode for setting up large simulation queues. By making use of the object oriented nature of Python, dualfoil.py allows the user to generate, organize, and visualize the electrochemical responses from the battery. Cell potential, anode and cathode active material utilization, and power/energy densities of multiple battery scenarios are modeled and presented, demonstrating the iterative capability of dualfoil.py. This versatile program allows for users of any skill level to achieve robust results in a control oriented and rapidly deployable manner.

Mathematical/Computational Science

Poster Number 63: Prithvi Sulaya

Longitudinal Analysis of Sleep Debt and Workload in Simulated Astronaut Crews

The project involved using efficient data analytics methods with the application of programming languages to come to useful conclusions regarding sleep depth and workload. The Hawaii Space Exploration Analog and Simulation (HI-SEAS) conducts simulated Mars missions on the slopes of Mauna Loa volcano in Hawaii. HI-SEAS is simulating the challenges of long-duration space exploration to improve astronaut crew selection criteria; crews of six “Astronaut-like” individuals are immersed in ”Mars-like” terrain in Hawaii for 4-, 8-, and 12-month missions. From the vast data previously collected, valuable observations were made which would allow a greater understanding of the information collected. Furthermore, various conflicting information and other possible issues with the wearable devices were recognized as part of the project work.

Mathematical/Computational Science

Poster Number 67: Alexander Milaszewski, Sarah Mathena

Online Particle Size Distribution

In the Pharmaceutical Industry there is a solid dosage dominance, in which tablets are a major percentage. The tableting process is continuous, but quality cannot be assured in a continuous

manufacturing. As a consequence, the tablets are produced in batch. In the recent decade, FDA started promoting the idea of quality-by-design (QbC). The idea is to identify the variables that are link to the final product quality, critical quality attributes (CQA), and monitor them with process analytical technology (PAT) tools online. Switching over to continuous manufacturing can improve the quality of the product and save the industry billions of dollars every year. / One of the three main routes to produce tablets is dry granulation. In this process active pharmaceutical ingredient (API) and excipients are mixed and put through the tableting process that includes roller compaction, and milling. For this project we focus specifically on the roller compactor, and the experiments were carried out in the pilot plant located in POTR B36. / So far this semester, we have looked at the particle size distribution (PSD) measurements for the granules in the dry granulation line. PSD is important because it is related to the tablet hardness, which is one of the final CQA. The variables that we changed to create the ribbons and granules are: composition, pressure and milling speed. The main goal is to relate the density with the granules PSD and determine this relationship online. The ribbons bulk density is measured in the GeoPyc instrument. The granules PSD is measured with the Innopharma Eyecon Camera inline: while we use a sieve analysis to measure PSD offline. At the end of the project, we need to determine if the Eyecon is a suitable tool for online measurement.

Mathematical/Computational Science

Poster Number 73: Nicholas Termini

QMD Modeling of Thermodynamic Properties of Warm Dense Aluminum

Warm dense matter (WDM) is formed during nuclear bursts, intense laser-matter interactions in inertial confinement fusion, and particle beam-target interaction experiments. As WDM represents a complex regime at the interface of condensed matter and plasma physics, the conventional theories developed for these fields are inadequate to predict the thermodynamic properties of warm dense plasmas. Experimental data are also scarce making computational models an incredibly useful tool. In this work, we investigate the equations of state (EOS) for Al at specific densities within the WDM regime. The computations are performed using the quantum molecular dynamics (QMD) method implemented in the QuatumEspresso (QE) package. The QE software represents an integrated package of computer codes for electronic-structure calculations and materials modeling. The QMD-calculated EOS of warm dense Al are validated against the data available in the literature. The overall good agreement is found. The relationship between pressure and temperature for warm dense Al at near and above solid-state densities is investigated. It is found that the pressure is an increasing function of temperature. The pressure is also greater for higher densities. These QMD results provide useful insights into the phase diagram of warm dense Al in the WDM regime. Future research can be expanded to other elements and materials.

Mathematical/Computational Science

Poster Number 81: Grady Kusmulyadi

Taking Advantage of Missing Pattern

Currently, Regenstrief Center for Healthcare Engineering (RCHE) received a biometric data patient database from a healthcare clinic. This database provide valuable data regarding patient information and recorded biometric data on the patient based on their visit to the clinic. The database is useful for the healthcare provided to analyze patient health status and further have a better health management plan for each patient to prevent them from getting sick. However, current data shows that not all records have complete information regarding patient health status, some biometrics values from the database record are missing. This missing information will prevent the healthcare provider from analyzing and predicting the patient health status. Thus, the project objective is to extract a pattern from patient actual missing biometric data and build generalizable model from the pattern. A finding of pattern in the missing biometric data will be useful to the health care provider for an opportunity of improvement in their service. This pattern may come out from relation between each actual biometrics data, or it may also be shown by relating patient demographic data to the biometrics data. Further, this generalizable pattern can be leveraged to build missing imputation model that could estimate the missing value from the patient biometric data, and hence give healthcare provider more useful information for decision making in the patient health management. R computation programming is used as main tool in this project.

Mathematical/Computational Science

Poster Number 36: Kristen Adair

Aluminum-Modified Lead-Free Solder Alloy Environmental Aging

This project is based on Sn-based Pb-free soldering alloys with a focus on intermetallic compound (IMC) growth, specifically of Sn, Cu, and Al. Different CuAl compounds showed degradation in previously tested wire samples of Sn - 3.0 Cu - 0.4 Al after room temperature exposure for more than a year. To understand the changes, a preliminary experiment was designed that subjects new samples of the old wire as well as another composition of old wire, Sn - 1.25 Cu - 0.2 Al, to be submerged in 0.1 M NaCl at room temperature or kept in normal atmosphere at 175 C for one week. Using the Phenom desktop SEM for analysis, the samples show both surface oxidation and IMC growth in both conditions, but to what extent is unclear. To have a better understanding of the preliminary results, new wire samples of the alloys are cast and subjected to three different conditions: room temperature and vacuum, room temperature and normal atmosphere, as well as 200 C and normal atmosphere for four and

eight weeks in each environment. Once samples are tested completely, energy dispersive x-ray spectroscopy (EDS) is performed to determine exact chemical composition changes. While EDS results are not final, current samples show IMC growth but the exact composition analysis is still in progress.

Physical Science

Poster Number 42: Xin Li Phuah

Carbon Spheres as a High Capacity Anode for Sodium-ion Batteries

The growing global concern for energy storage is due to the increase in energy demand, which in turn calls for an increase of rechargeable batteries. Lithium-ion batteries (LIBs) has been the primary solution to the energy demand and are well-known for providing long cycle life and rate capabilities. Due to the scarcity of lithium resource, sodium ion batteries (SIBs) are rapidly gaining widespread attention as an alternative due to its natural abundance, economical cost, and better safety factors. However, the sodium ions inhibits the use of traditional anode materials and will require new revolutionary materials that can accommodate electrochemical sodiation mechanisms. / / Herein, we present a rapid synthesis approach (<5mins) for producing spherical carbon precursors derived from resorcinol-formaldehyde as anode materials for SIB. The carbon structure, morphology, and electrochemical performance have been investigated for the as derived carbon spheres pyrolyzed at 900ºC and 1800ºC (CS900 and CS1800). The low specific surface area (89.3m2/g) and high pore volume (0.244cm3/g) of CS1800 demonstrated a higher maximum reversible capacity of 230mAh/g (C/20) compared to CS900. The commercial-viability of the synthesis process and the high capacity of the carbon spheres show tremendous potential for an anode material in SIB applications.

Physical Science

Poster Number 43: Matthew Parsons

Characterization of Composition and Ionic Effects on Superabsorbent Hydrogel Polymers for Internal Curing of Cement

In order to improve the initial compressive strength and total final reacted mass of cement in construction, superabsorbent gels have been suggested as an internal curing agent, reducing the amount of free water during the initial set and later releasing the water in order to cure unreacted cement mass. Swelling behaviors of superabsorbent hydrogels were observed in a variety of solutions, including reverse osmosis water and solutions of sodium, calcium, and aluminum ions. Hydrogels were made of poly(sodium-acrylate acrylamide) (PANa-PAM) with varying poly(sodium-acrylate) (PANa) concentrations (33% and 67%) and a 2% crosslink density.

In addition, the specific ion absorption and release behavior of 67% PANa gel was observed in calcium-rich solutions by determining the amount of calcium entering and leaving the gels, respectively, via titration. The effects of aluminum on calcium-rich hydrogels was also observed. The higher poly(sodium-acrylate) concentration tended to have the higher swelling ratio, and the addition of ions in general reduced the overall swelling ratio. Calcium ions tended to cause a greater loss of swelling capacity at higher poly(sodium-acrylate) ratios while aluminum ions exhibited a lower loss of swelling capacity under the same conditions.

Physical Science

Poster Number 44: Benjamin Helfrecht

Charge State Calculations for Copper Defects in Amorphous Silicon Dioxide

Electrometallization cells (also referred to as conductive-bridging random access memory, or CBRAM) are a form of non-volatile computer memory that shows promise as an alternative to traditional complimentary metal-oxide semiconductor technology. However, the reactions that govern the behavior of electrometallization cells are not well-understood. To gain a more theoretical understanding of these systems, the formation energies of charged Cu defects in amorphous SiO2 were examined with density functional theory as implemented in the simulation package SeqQuest. Defects consisting of one to six Cu atoms with a single positive charge appeared to act as good traps for holes. Defects with an integer charge of two failed to exhibit charge localization, suggesting that these defects did not serve as traps for electrons or holes. As the number of Cu atoms in the SiO2 was increased, the formation energies of the doubly charged Cu defects approached those of the singly charged defects. The Cu-SiO2 systems also showed increased metallic character -- as evidenced by a smaller band gap and an increased presence of defect states within the band gap -- with an increased number of Cu atoms.

Physical Science

Poster Number 45: Oksana Makarova

Designing metamaterial antennas for improving the efficiency of single-photon sources.

In the past few years, the creation of efficient single-photon sources (SPS) for quantum communication and quantum information processing has been actively pursued. One of the possible solutions for constructing an SPS is to use atom-like centers in solids, such as nitrogen-vacancy (NV) centers in diamond nanocrystals. The main advantages of NV centers are the room-temperature operation and the potential to be integrated with other solid-state platforms. / Some of the important criteria of a good SPS are high quantum yield, emission rate,

and directional emission. In order to improve these characteristics, we couple NVs to nanophotonic structures. Since NV centers have a broadband emission spectrum, it is impractical to use traditional resonance-based approaches. Instead, we place the centers on a metamaterial with hyperbolic dispersion. The metamaterial is realized as a combination of alternating ultrathin layers (epitaxially-grown superlattice) of TiN and AlScN. However, the use of hyperbolic metamaterials for this application is problematic, since it is difficult to outcouple the electromagnetic waves propagating inside the metamaterial. To couple light out of these modes into the far field, we aim at constructing a bullseye antenna around a single nanodiamond containing an NV center. The antenna will contribute momentum to the metamaterial plasmons and, as a result, enable them to scatter to free space modes more efficiently to be collected with an optical objective. We simulate the bullseye nanoantenna using a finite element method to find the optimal geometric parameters. The optimized parameters such as depth, number of rings, nanodiamond position, and grating period, will be used to perform the fabrication of the grating. Our results can enable a high-efficiency CMOS-compatible SPS operating at room temperature. /

Physical Science

Poster Number 46: Steven Wilson

Detecting trace crystallinity in Amorphous solids through triboluminescence

Amorphous solids are used in pharmaceutical industries to provide increased bioavailability for poorly soluble active pharmaceutical ingredients. However, Amorphous solids are metastable and will crystallize over time resulting in a decreased therapeutic effect. We have developed a method based on triboluminescence for detecting the crystallinity of an amorphous solid that is inexpensive and accurate enough to detect crystallinity concentration of 15 ppm. Triboluminescence is the emission of photons from crystalline solids that are piezoelectricically active and able to support fluorescence when subject to mechanical stress. Our process was developed to detect these emissions, and based on these detections, measure the crystallinity of the sample in question. Instrumentation is in development to stimulate mechanoluminescence (triboluminescence induced by a mechanical force) and soniluminescence (triboluminescence induced by sonication forces) of amorphous solids to determine trace crystallinity content within the powder blend. Current measurements indicate that both mechanoluminescence and soniluminescence provide reliable and inexpensive detection of trace crystallinity through measurements of photon emissions.

Physical Science

Poster Number 47: Nicholas Sherck

Development of "Uniform poly(Lactide-co-Glycolide)" Products

The synthesis of poly(lactic acid), PLA, is facile in the presence of the cyclic, organic amidine catalyst 1,8-Diazabicylo[5.4.0]undec-7-ene, DBU. Since DBU's catalytic capability was first reported by Lohmeijer in 2006 for ring-opening polymerizations (ROP), there have been numerous studies conducted by a variety of groups on the catalytic functioning of DBU in the ROPs of cyclic esters resulting in a large body of un-unified material from a mechanistic standpoint. This lack of clarity will hamper engineering polymers with desired characteristics from the widely used, biologically compatible, cyclic ester and lactone monomers. The work outlined herein seeks to paint a unified picture of the mechanisms in the DBU catalyzed ROP of lactide to provide a solid foundation upon which Uniform PLGA – poly(lactic-co-glycolic acid) – Products can be engineered. In providing this unified picture of the ROP our work encompassed: (i) proposing a detailed reaction network scheme, (ii) conducting syntheses over a range of initial concentrations of lactide and DBU, and (iii) kinetic modeling to further support the proposed reaction network. As a result, our work has produced: (i) kinetic data, (ii) a consistent, viable reaction scheme verified through kinetic modeling, (iii) deduced and quantified the interplay between polymerization routes facilitated by the presence of DBU demonstrating the need for detailed kinetic studies to deconstruct complex reactions, (iv) the first experimental evidence in support of the combination of ketene aminal-ended chains with alcohol-ended chains, and (v) analyzed the robustness of the catalyst to acid contamination.

Physical Science

Poster Number 53: Devin Zuck

Evaluating The Thermoelectric Enhancement of Open Shell Pendent Groups on Thiophene Backbone

Evaluating The Thermoelectric Enhancement of Open Shell Pendent Groups on Thiophene Backbone / / / Thermoelectric devices interchange thermal and electrical energy, and are used for waste heat recovery or spot cooling. The efficiency of this energy conversion is governed by material parameters including electrical conductivity, thermal conductivity, and thermopower (Seebeck coefficient). There are a number of inorganic compounds that display these favorable material characteristics, but their precursors are rare and device fabrication often requires costly high temperature processing conditions. Fortunately, polymer based thermoelectric materials are an attractive alternative because of their abundant precursors, room temperature processability, and tunable properties. Furthermore, the phonon scattering

nature of glassy materials provides polymeric semiconductors with a more desirable thermal conductivity than their inorganic counterparts Here we explore the possibility of closing the gap between organic and inorganic thermopower through charge filtering via redox active pendant groups. The synergistic combination of a conjugated polymer backbone with radical pendant groups may provide increased thermopower while retaining high electrical conductivity. The specific monomer studied has been synthesized, polymerized, and characterized. Further work is required to optimize synthesis and explore various radical concentrations. If successful, this new polymer could be an easily processable alternative to current inorganic devices. /

Physical Science

Poster Number 55: Payson Dieffenbach, Michael J. Marino, Liesl A. Krause

Exploring the Effect of Sample Properties on Spark-Induced Breakdown Spectroscopy

Optical emission spectroscopy techniques such as laser-induced breakdown spectroscopy (LIBS) and spark-induced breakdown spectroscopy (SIBS) provide portable and robust methods for elemental detection in real-time. These emissions are then utilized for quantitative and qualitative analysis of the sample. For both techniques, the main obstacles have always been signal intensity, accuracy, and sensitivity of detection. The main advantage of the SIBS method is more safe operation, while still maintaining the portability of the technique. With the availability of more advanced high powered pulse generators, SIBS provides an attractive alternative for multi-elemental detection in real time. In this study, detailed characterization of spark induced plasma, analyte emission intensity, plasma temperature, electron density, and plasma persistence has been studied for various metallic samples with varying physical properties. Target samples, including Mg, Al, Cu, Ta, Sn, Fe, Co, W, and Mo were chosen based on their diverse set of properties, including: melting point, boiling point, first ionization potential, and conductivity. The role of sample properties on temporal evolution of SIBS signal and plasma characteristics was studied by varying the spark energy from 30 mJ to 180 mJ. Certain parameters such as the conductivity of the material greatly affect the SIBS signal intensity output. Mechanisms of SIBS plasma evolution are discussed in the context of material properties and optimal signal detection approaches are proposed. Principle component analysis is used to determine the dominant material properties that affect the SIBS signal intensity and plasma properties.

Physical Science

Poster Number 62: Sydney Weiss

LCA of Nano-Composites in Disposal Phase.

This study was conducted for the purpose of developing an increased understanding of the disposal phase for several nano-composites. Brominated flame retardants (BFRs) are chemicals found in most electronics, furniture, building materials, and many other household items. They have been helpful to stop fires, however, BFRS have shown to have a tendency to bioaccumulate. Therefore, there is need to replace the BFRs with an alternative. Nano-composites have been a promising alternative. One of the mechanisms of measuring the success of this alternative would be to analyze the ability of the composite to bind to the product it is incorporated with instead of being a coating. This would lead to less leaching, and therefore bioaccumulation. Landfill-like environments were simulated and composites were placed within the environment to observe the leaching characteristics. The leachate will be characterized through the use of a gas chromatography-mass spectrometer. This will indicate the presence or lack of presence of the composite tested. These results will provide evidence to further the research in eliminating BFRs and creating a better alternative. /

Physical Science

Poster Number 64: Hannah Brown

Material Characterization of Soft Robotics

The mechanics and properties of soft materials are a fundamental part of soft robotics. Deformable components such as liquid metal sensors made from an alloy of gallium and indium (called EGaIn) and elastomeric joints show promise as components of soft robots, though detailed measurements of these structures are required. EGaIn sensors are used in the field of soft robotics because of their elasticity and high conductivity. However, their tendency to fail makes them difficult integrate into systems. We investigated sensors made from channels cut in Sylgard 184 by applying point loads between 0.6 kg and 4.4 kg, and found that sensors with a thicker substrate were more sensitive to pressure, and sensors with higher aspect ratios were more likely to fail after use. By knowing this, it may be possible to design sensors based on the desired sensitivity and durability. In order to construct soft robots, it is necessary to have a soft equivalent to the joints used in hard robots. One possible soft robot design is a Stewart Platform, made using a hollow cylinder of an elastomer (Dragon Skin 10). The cylindrical pseudo joint was tested for linear and torsional spring constants by applying forces to the work platform. This stiffness information will make it possible to find the position of the top platform if the forces and positions of the actuators relative to the joint are known.

Physical Science

Poster Number 65: Waikien Goh

Mechanical Characterization of Lithium Rich Cathode Materials for Lithium Ion Batteries

Lithium-rich layered oxides have become attractive materials due to its' high energy density and high voltage lithium ion batteries for high capacity applications. However these oxides materials suffer from large irreversible capacity loss and poor rate performance due to structural transformation. In this work, we have utilized the Scanning Electron Microscope (SEM) in order to monitor the structural change during high and low voltage cycling of a lithium- and manganese-rich 〖Li〗_1.2 〖Co〗_0.1 〖Mn〗_0.55 〖Ni〗_0.15 O_2oxide cathode. We prepared coin cells with the cathode materials and charged them using the. The microstructure of the cathode material was monitored for first cycle and compared with the following cycles. Structural transformation of the cathode material was associated with the state of charge of the coin cells. The structural change of the cathode material was observed after subsequent cycling and is believed to be the main contributor to the voltage and capacity fade.

Physical Science

Poster Number 66: Sebastian Camilo Mendoza Rincon

Modeling of DC Breakdown in micro to meso scale gaps with field-emission enhancement due to nanopetal decorated cathode

Field emitters are nanostructures that release electrons through the quantum tunneling of electrons from the surface under strong electric fields (~109 V/m). They have been widely used in technologies such as electron gun sources, vacuum nanoelectronics and displays. The electrode surface irregularities have been found to enhance the electric field up to two orders of magnitude. Field emission at few micron inter-electrode distances generates a natural breakdown at a voltage below 100 V due to this electrode surface irregularities. It has been reported that surfaces with nanostructures enhance the electric field at their tips by thousands of times Cheng (2003). Thus, voltages as low as 100 V would be enough to cause breakdown at the mm-scale. Here we assume that a cathode decorated with nanopetals could have a field enhancement factor of 5,000 McCarthy(2013). We compute the breakdown characteristics for gaps ranging from a few microns up to a cm at different pressures using Venkattraman and Alexeenko's (2012) model and Ahegbebu's code(2015). We further develop the solver for very high field enhancement case to resolve numerical instability with the regular approach. Future experiments with nanopetal-decorated cathodes will be performed to verify these calculations.

Physical Science

Poster Number 70: Brenden Hamilton, Quentin Lewis

Predictive Atomistic Modelling of the Ignition and Growth Behavior of the Explosive RDX

In materials science, many materials properties can be explained through atomistic processes, Molecular Dynamics (MD) is a simulation tool aids in this endeavor. In this work we show MD can be used to simulate initiation in both the amorphous and crystalline phases of the energetic material RDX. The simulations provide unprecedented detail about the thermodynamic principals and chemical kinetics. Initiation occurs through the expansion of a localization of thermal energy (Hotspot), which kick starts the overall reaction behavior. Contrary to expensive shock compression simulations, hot spots can be 'seeded' into a well-controlled environment of our choosing. The seeded hotspots have varying temperatures and sizes, which are deciding factors in criticality of ignition. The initiation of exothermic chemical reactions prevents the quenching and commences a steady burn that grows at several hundred meters per second to engulf the entire material, decomposing all of the initial RDX species. We found critical initial temperatures for nanometer sized hotspots that vary between amorphous and crystalline RDX. In addition to exothermic chemistry, differences in thermal conductivity between amorphous and crystalline RDX as well as dimensionality play a role in their criticality. These simulations show the essential role of hotspots in the initiation of energetic materials and the data collected here provides necessary reaction kinetics information for modelling tools that predict the safety and reliability of these materials.

Physical Science

Poster Number 74: ZIYU CAI

Rheological Characterization of HPAM Solutions with the Addition of Halogen Salts

Hydrolyzed polyacrylamide (HPAM) is the most commonly used polymer in chemical method of enhanced oil recovery. The rheology of the HPAM3330 solution and the effects of addition of salt, KCl was tested via rheometer. The results indicate that the addition of salt decreases the viscosity of polymer solution remarkably, due to the screening negative charges included by carboxyl groups. Increasing salinity commonly decreases the viscosity of the solution at a specific shear rate, but above a certain concentration of the salt, which was defined as critical salinity, the increase in salinity only effects the viscosity of solutions slightly. The critical salinity is around 0.17M. To further test the effects of other salt, the similar tests would be conducted for salt like NaCl, $MgCl_2$,and $CaCl_2$,

Physical Science

Poster Number 76: Lena Abu-Ali

Sorption of Azithromycin in Soils

Pharmaceuticals and personal care products are of emerging concern as contaminants in soil and water systems. Azithromycin, a macrolide antibiotic used to treat bacterial infections, is one of the most commonly prescribed drugs in the United States and has recently become a compound of environmental interest. Although azithromycin has been detected in effluent from wastewater treatment plants, little is currently known about its behavior and environmental fate. This is especially important as pharmaceutical-containing biosolids are land-applied to soil. The purpose of this study is to characterize the sorption behavior of azithromycin in soils order to assess its potential as a groundwater and/or soil contaminant. Soil-water partition coefficients will be experimentally derived to estimate partitioning behavior. Five to seven soils with varying properties will be selected from available soils, with cation exchange capacity and soil pH as key variables. Soils will be autoclave-sterilized to minimize loss due to biotransformation, and both solution and soil phase concentrations will be measured using LC-MS analysis. Because of its relatively low solubility, relatively high pKa, and predominately positive charge in the environmentally relevant pH range, azithromycin is predicted to have moderate to strong sorption to soils. This implies that persistence in soil is more likely than transport to groundwater, and that azithromycin will likely have limited mobility once incorporated into the soil. Understanding the sorption behavior of this compound expands our knowledge of how organic bases partition between mediums and help quantify the environmental risk associated with its presence in soil-water systems.

Physical Science

Poster Number 77: Santiago Serrano

Spin-Photon Coupling in a Double Quantum Dot

Taking advantage of the interaction between light and matter is an advantageous step in quantum computing because it exploits the characteristics of both electron and photon quantum states. While semiconductors are promising candidates to do the actual quantum computation because of the long coherence times they present and the already available fabrication industry around them, photons are more suitable for the quantum communication protocols, allowing for long distance transmission of quantum states. In this work, we use an atomistic tight-binding model to study the electronic structure of semiconductor quantum dots and how their charge and spin states couple with cavity photons. It is investigated how the spin-photon coupling in an electrostatically defined double quantum dot (DQD) can be

engineered using the size and shape dependent quantum states of the DQD, the intrinsic spin-orbit interaction of the material, and the inhomogeneous magnetic fields from integrated nano-magnets.

Physical Science

Poster Number 78: Kyla Prendergast

Surfactant-Polymer Interactions with Plastic Drinking Water Conveyance Materials

After contamination of drinking water supplies, the current response is to flush the system until the water can be deemed to have returned to pre-contamination levels. A significant challenge posed by this process is that contaminants can sorb into plastic premise plumbing components, and thus may desorb into the clean drinking water. A possible solution to expediting premise plumbing cleaning could involve utilizing surfactants that infiltrate the plastics and remove contaminants. This study was conducted to determine the effect three surfactants on the integrity of plastics commonly found in premise plumbing. Plastics examined include: polyethylene (PEX) pipe, high-density polyethylene (HDPE) pipe, low-density polyethylene (LPDE) resin, and ethylene propylene diene monomer (EPDM), chlorinated polyvinyl chloride (CPVC), and polyvinyl chloride (PVC). Plastic specimens were immersed in three surfactant solutions for up to 21 days. Dimensional and weight analysis was conducted for specimens during 3, 7, 14, and 21 days of exposure. Of the surfactants tested, MAG-IT exposure increased the weight of the PVC by about 0.2% after 14 days, but increased the weight of the LDPE by about 46% after 21 days. The other surfactants, Dawn and Alconox, had little to no effect on the weight of the plastics. Follow-up testing using d-limonene, a major constituent of MAG-IT, indicated that d-limonene was likely responsible for dimensional and weight changes. Results indicate some surfactants can damage plumbing components, while others have little to no detectable impact. Additional work is needed to examine the ability of the surfactants to remove selection contaminants from pipes. /

Physical Science

Poster Number 80: Nikhil Bharadwaj

Tailoring molybdenum fiber-form nanostructures (Mo-fuzz) using carbon impurity under helium ion irradiation in extreme conditions

The performance of plasma facing components (PFC) is of great important for the realization of prototype nuclear fusion. Tungsten (W) has been considered as the leading high-Z PFC material for these reactors and tokamaks due to its superior thermos-physical properties, high melting point, low sputtering yield, and low tritium inventory. However, its surface deteriorates

significantly under helium ion (He+) irradiation in extreme (fusion) conditions and forms nanoscopic fiber like structures (fuzz). Formation of fuzz nanostructure on W can be suppressed by the presence of plasma impurities such as carbon (C) and beryllium. We present, the effects of C impurity on molybdenum (Mo) fuzz evolution due to He+ ion irradiation. For mixing the C impurity on Mo surface, a mixture of helium and methane gas has been used. Separate experiments with 100% pure He+ and with mixture gas have been performed. Ion energy (100eV), ion-flux (7.2 □ 1020 ions m-2 s-1), ion-fluence (2.6 □ 1024 ions m-2) and target temperatures (923K) were chosen from our previous studies and fixed constant throughout the study. Post irradiation, surface modification and compositional analysis, were studied using scanning electron microscopy and X-ray photoelectron spectroscopy, respectively. Optical-reflectivity measurements were also performed for monitoring the surface deteriorations occurred due to ion irradiations. Our results indicate that 0.5 % C impurity may prevent almost all the Mo fuzz formation. Since fuzz evolution in PFCs (viz. W and Mo) is a very serious concern for all the tokamaks including ITER; the study has significant relevance in fusion applications.

Physical Science

Poster Number 82: Jacklyn Hall

The Effect of Aqueous Reaction Environments on Lewis Acidic Beta Zeolites for Catalytic Biomass Conversion Routes

As the pressure to reduce greenhouse gas emissions increases, biofuels derived from renewable biomass sources provide a feasible substitute to fossil fuels such as petroleum due to their lower net CO2 production. A leading biomass-to-biofuel pathway includes the isomerization of glucose to fructose as an important reaction step. This process is catalyzed by active sites of isolated tin atoms within the framework of Beta zeolites (Sn-Beta). Upon exposure of Sn-Beta catalysts to aqueous reaction conditions and high temperatures (100 C), rates of glucose-fructose isomerization increase and reach a maximum at low exposure times (10-60 minutes) and then decrease at longer exposure times (> 60 minutes). To determine the state of the catalyst and the active Sn site structures in these two regimes, water treatments were performed on the Sn-Beta catalysts for varying amounts of time. Pyridine and deuterated acetonitrile infrared spectroscopy was utilized to quantify the number of different types of Sn sites on the catalyst before and after hot water treatment. In addition, atomic absorption spectroscopy was performed on catalyst samples treated at long exposure times in hot water to uncover structural changes to the active sites such as leaching of the metal into bulk solution. These methods provide a viable means of understanding the effect of aqueous reaction conditions on Sn-Beta zeolites in order to uncover differences in their kinetic behavior due to changes in catalyst structure.

Physical Science

Poster Number 83: Payson Dieffenbach, Michael j. Marino

The Effects of Laser Pulse Energy, Spot Size, and Wavelength on Laser Produced Plasmas in Transverse Magnetic Fields

Laser-produced plasmas (LPP) are used for various applications including laser induced breakdown spectroscopy (LIBS), extreme ultraviolet (EUV) lithography, pulsed laser deposition (PLD), and nanoparticle generation. In this study, the influence of a transverse magnetic field, varying wavelengths and spot sizes, and pressure conditions on nanosecond laser-produced plasma is studied and presented. To generate a nanosecond plasma, a Quantel Q-Smart 850 mJ pulse laser (λ: 1064, 532, 266 nm and FWHM: 7 ns) is used to ablate three different samples of aluminum, copper, and tungsten. A permanent magnetic trap was used with nearly uniform magnetic field of 0.8 T to control plasma expansion dynamics. These samples were ablated using varying fluences (spot size, energy, and wavelength) in vacuum and atmospheric conditions. Fast photography was performed using an intensified charged coupled device (ICCD) to study the plume dynamics. Secondly, optical emission spectroscopy (OES) was used to determine the temperature, electron density, and ionization rate of the plasma plume. In the presence of a transverse magnetic field and in vacuum conditions, enhancement in the emission of key ionic lines and plasma temperature was found. It was observed that spot sizes, wavelengths, and mass number also had varying effects on the plume dynamics.

Physical Science

Poster Number 85: Ran Cui

Tool for automating the process of nanofabrication using focused-ion beam

Nanophotonics has experienced a tremendous growth in the past decade largely due to the development of nanofabrication techniques, such as electron-beam lithography, reactive ion etching, and focused ion beam milling. Specifically the attention in this work is drawn to the technique of focused ion beam milling. In this technique, a tight beam of accelerated ions impinges on a sample surface and removes locally parts of the sample material, i.e. ion beam drills nanoscale holes with a typical diameter of 10-50 nm in the sample. In general, any arbitrarily shaped nanostructure can be viewed as a set of these holes with specific in-plane coordinates and depth. Instead of typing manually the parameters for each hole, the list of parameters for all the holes can be generated automatically given the nanostructure shape. In the scope of this work, we have developed a tool based on MATLAB that can automatically generate a list of parameters, so-called stream file, which can be directly uploaded to the software of available focused ion beam setup (FEI Nova 200). Current capabilities of the tool

include generation of stream files for arrays of circular nanoholes and sets of slot or v-groove shaped trenches. In addition, the tool includes a graphical user interface. In our research, we plan to use the developed tool to speed up the fabrication of nanophotonic waveguides which will serve as a key part of a nanoscale quantum register. In the future, we are planning to expand the tool capabilities for other shapes of nanostructures and turn it into an online application available on nanohub.org.

Physical Science

Poster Number 86: Hannah Woods

Using mechanical testing and differential scanning calorimetry to study the properties of semi-crystalline polypropylene and poly(ethylene-terephthalate)

Semicrystalline polymers characteristically have distinct anisotropic properties in directions parallel and perpendicular to their direction of molecular alignment, and often this molecular alignment is directly related to processing methods. It is also known that high crystallinity generally relates to stiffer mechanical behavior, and glass transition temperature also effects polymer stiffness. The goal of this study was to understand the semi-crystalline properties of polypropylene (PP) and poly(ethylene-terephthalate) (PETE) by studying the effects of processing, glass transition temperature, and degree of crystallinity on the mechanical responses of these polymers. To first understand the effects of processing in PP and PETE, tensile tests were performed on samples cut from commercial cups in directions parallel and perpendicular to the base of the cup. Both PP and PETE were found to have strong anisotropic properties - ductile when pulled in the perpendicular direction, and relatively stiffer when pulled in the parallel direction. It was concluded that this anisotropy was due to the processing-induced orientation of the polymer backbone. From these tests, it was noted that PETE had mechanical properties almost two times greater than those of PP, which was related to glass transition temperature and degree of crystallinity. After deformation, it was also noted that the parallel PP samples showed a substantial increase in opacity. Differential scanning calorimetry (DSC) was performed on both mechanically deformed and pristine PP and PETE samples to relate mechanical stiffness to the relative crystallinity of each, and to determine if the opacity change in PP was due to strain-induced crystallinity.

College of Health and Human Sciences

Physical Science

Poster Number 112: Alaina Preddie

Influence of Prior Experience on Operation of Simulated Construction Equipment

Simulators are used in the construction industry to train heavy equipment operators because they are cost-effective and safe; however, not much research has been conducted to validate that performance on the simulators is similar and transferable to that on real machines. In the present study, individuals who reported having prior experience operating heavy construction or agricultural equipment and those who reported having no such experience had their performance tested on an excavator simulator. Each participant in the study, regardless of experience level, was initially introduced to the excavator simulator and given an opportunity to practice the basic controls. They were then asked to complete three task modules, counterbalanced for order across participants. The tasks in each module were distinct from one another in regards to the requirement to drive, the specific control movements of the joysticks, and the overall goal to be completed. The main question of the study was whether persons experienced with real heavy equipment operation would perform better on the tasks on the simulator than persons without such experience. Such a result would indicate positive transfer from the real machines to the simulator, implying that at least some of the processes involved in operating the real and simulated machines are the same. A lack of difference in performance on the simulator could indicate little overlap in processes with operation of real machinery or the fact that the experience of most of the participants was not specifically with excavators.

Innovative Technology/Entrepreneurship/Design

Poster Number 89: Hui-Hsuan Kuo

The independent roles of genetic background and dietary calcium intake on colon epithelial cell proliferation in mice

Colorectal cancer (CoCa), a disease associated with both genetic and dietary factors, is the second most common cause of cancer death in the U.S. Evidences show that mice with different genetic backgrounds have different sensitivities to azoxymethane(AOM)-induced CoCa, while sufficient dietary calcium intake prevents the disease's development. Since the increased colon epithelial cell proliferation rate is the early initiating step of CoCa, we hypothesize that both genetics and calcium intake would alter colon epithelial cell proliferation rate in mice. To test the hypothesis, we first selected mice from three inbred lines (C57BL/6J,

SWR/J and A/J) with the different sensitivities to AOM-induced CoCa, and then fed them with an either sufficient (0.5%) or deficient (0.25%) calcium diet from 4 wks old. At 12-wks of age, mice were sacrificed and the colon samples were prepared as formalin-fixed paraffin-embedded blocks. Colon epithelial cell proliferation rate was determined by measuring the percentage of cells with positive Ki-67 immunohistochemistry staining within the colon crypts. Our data demonstrated that mice with different genetic backgrounds had significantly different percentages of Ki-67 positive cells in the colon, suggesting that genetic factors had potential effects on colonic epithelial cell proliferation. However, reduced dietary calcium intake had no effect on colon epithelial cell proliferation rate in any of the inbred lines, and no gene by diet interaction was detected in this study. The major finding of the study is that genetic factors, but not dietary calcium intake, influences CoCa risk potentially by altering colon epithelial cell proliferation rate.

Life Science

Poster Number 93: Sarah Loerch, Abigail Chapleau

A survey on common myths about voice.

Vocal strain is common in speakers. Each individual has his or her own method of coping with vocal strain. In a New York Times article by Brendan Prunty, 'Vocal Strain Poses Long-Term Risks for Coaches. Anyone Have a Lozenge?', he reports on the different compensatory strategies that coaches use to soothe their strained voices including using cough drops, honey, gargling salt water, and drinking cups of tea. These strategies have not been scientifically proven to be effective and are considered myths. In order to determine which myth is most agreed upon by the public, a survey will be conducted using Google Forms. This survey will target a population eighteen years and older, and will not be exclusive to any particular group. The survey begins with general demographic questions including occupation, hours of daily voice use, and voice and musical training. Next the survey will ask participants whether the myths help or harm their voice. These myths were selected by researching opinions posted online. These myths chosen were frequently repeated by various sources. Using a multiple choice format, the survey will assess whether a myth is harmful, helpful, neither, or not known. These data will be summarized to fully understand how speakers perceive their voice.

Life Science

Poster Number 94: Emma Wallens

Accuracy of the K XRF machine versus the Portable XRF machine in the Measurement of Lead Content in Condor Bones

There already was data on the accuracy of the K XRF machine in measuring the lead of condor bones, and the R^2 value was around 0.9. I used the portable XRF machine to measure the lead content of the condor bones after initially calibrating it with phantoms of various ppm (no lucite was used), and compared these results with the help of a graduate student using matlab, with those of the K XRF machine, and the R^2 value of both of these combined was 0.8<x<0.9, which meant that it matched up pretty well, and could be used in wildlife research. The lead content in condors has been a concern over the years because of the lead ammunition found in the animals that they scavenge; should the portable XRF prove to be accurate after more measurements (with lucite that would mimic skin) , then researchers would be able to use this machine on the job, rather than having to deal with bulkier equipment.

Life Science

Poster Number 95: Morgan Kramer

Anti-Oxidant Enzyme Expression Induced by PhIP in Cell Culture Models

Parkinson's disease (PD) is a disorder that affects nearly one million people in the United States and is the second most common neurodegenerative disorder. Some symptoms of Parkinson's disease include resting tremor, bradykinesia, rigidity, and postural instability. This disease has been found to affect different regions of the brain, especially substantia nigra, a small region located in the midbrain which is responsible in coordinating motor movement. In Parkinson's disease, more than 50% of dopaminergic neurons are lost. Only 10% of PD patients are familial cases with inherited mutation. The remaining portion is considered sporadic, meaning that the disease is likely developed due to exposure to some environmental factors. However, these environmental factors are not well identified yet. In this project, I am looking at a carcinogen called 2-amino-1-methyl-6-phenylimidazo(4,5-b)pyridine or PhIP, which is a heterocyclic amine produced in meat cooked at high temperatures. The goal of this project is to determine whether PhIP affects anti-oxidant enzyme expression in vitro. I am treating SH-SY5Y human neuroblastoma cells supplemented with galactose or glucose with different concentrations of PhIP. The method for determining how the anti-oxidant enzymes in these cells are affected is to perform Western blot. Western blot is commonly used to detect and analyze proteins. While there are no results yet for this project because it is currently in progress, this should lead us

one step closer to a better understanding of PhIP-induced dopaminergic neurotoxicity in its correlation to Parkinson's disease.

Life Science

Poster Number 96: Emily Watson

Assessment of CCS as a Biomarker of Copper Status in Bariatric Surgery Patients

Background / Bariatric surgery is a popular and effective procedure as a treatment for obesity. However, an unfavorable consequence of bariatric surgery is that deficiencies in nutrients such as copper (Cu) may occur. Current screening methods that are used for Cu deficiency are not sensitive or specific enough to diagnose Cu deficiency or to detect changes in Cu status. There is a critical need for a better biomarker to assess Cu status, not only for bariatric surgery patients but also for the general population. / Objectives / The purpose of my research is to determine whether concentrations of copper chaperone for superoxide dismutase (CCS) in erythrocytes can be used as a biomarker for copper status in bariatric surgery patients . We will additionally determine whether we can observe changes in CCS concentrations in erythrocytes in response to changes in Cu status. / Methods / We obtained blood samples from subjects who had undergone bariatric surgery. Concentrations of plasma Cu were measured by inductively-coupled plasma mass spectrometry (ICP-MS). Concentrations of CCS in erythrocytes were measured using Western blotting. Also plasma copper and CCS concentrations were assayed in two separate groups of patients who were undergoing Cu (8 mg/day) and Fe supplementation (195 mg/day) for 8 weeks, respectively. / Results / We have screened 104 patients who have had bariatric surgery for Cu and Fe deficiency. Five deficient patients have received Fe supplementation while one has received Cu supplementation. The nutrient status of patients who were supplemented with Cu and Fe were normalized. There is ongoing testing of CCS concentrations in erythrocytes from these patients. / Conclusion / We expect to find CCS concentration in erythrocytes to be representative of Cu status in bariatric patients. We expect CCS concentrations to change following changes in Cu following supplementation. /

Life Science

Poster Number 97: Joseph Amaro

Changes in optineurin distribution in dopaminergic cells using a rotenone model of Parkinson's disease

Parkinson's disease (PD) is a neurodegenerative disorder characterized by the loss of dopaminergic (DA) neurons in the substantia nigra pars compacta (SNc) and the formation of intracellular inclusions known as Lewy Bodies (LB). LB pathology stems from increased levels of

misfolded cytoplasmic proteins such as alpha-synuclein, which can disrupt Golgi organization. Optineurin (OPTN) is a protein genetically linked to optic neuropathy and amyotrophic lateral sclerosis and is involved in several cellular pathways. Many of these pathways are critical in PD development; e.g. vesicle trafficking, maintenance of Golgi structure, autophagy, and mitochondrial dysfunction. Currently, it is unknown if OPTN is mechanistically involved in the pathogenesis of PD. We propose that the inability of DA neurons to remove proteinaceous aggregates may result from changes in OPTN expression or distribution. We previously found that OPTN is expressed in regions vulnerable to LB pathology. Here we utilized four rotenone dosing regiments to model PD – control (DMSO), 24 hours, 5 days, and end stage (based on behavioral phenotype) – following treatment. Each regiment utilized one animal to gauge changes in OPTN distribution. Very preliminary analysis suggest that the control and 5 day animals exhibit diffuse cytosolic distribution, whereas end stage tissue showed more robust staining with possible enrichment in the perinuclear region. 24 hour tissues exhibited strong staining similar to end stage, but with fine punctate structures located throughout the cytoplasm. Our preliminary analysis suggests that much more histologic and mechanistic work is needed to understand the potential pathogenic role OPTN may have in PD.

Life Science

Poster Number 101: Kendal Weger

Developing a LC/MS Method for Measuring Atrazine in Zebrafish Embryos

Atrazine is a common herbicide used in agriculture to kill broadleaf weeds. This synthetic chemical is the second most commonly used herbicide in the United States with volumes of 76 million pounds per year being used. Currently, there is not a routine protocol in place to detect low doses of atrazine in tissue of zebrafish embryos. Due to the extensive use of this toxicant in the environment, there is a need for a diagnostic protocol for detecting low doses of atrazine in tissue. This study highlights the use of LC/MS to detect atrazine in the embryonic tissue of zebrafish. This protocol briefly involves the following: 1) homogenize the tissue in 0.01% acetic acid, 2) add four volumes of acetonitrile, 3) vortex and incubate samples on ice, 4) centrifuge and separate the supernatant, 5) dry down the supernatant and reconstitute with 0.05% acetic acid in ethanol, and 6) run samples using LC/MS. The unique peak for atrazine using LC/MS has a molecular weight 215.8. After testing this protocol on zebrafish embryos exposed to atrazine concentrations of 3 ppb, 1 ppm, or 10 ppm, it was found that 1 ppm was the lowest concentration that was detectable using this protocol. Further experiments are now focused on refining the methods for detection of lower exposure concentrations of atrazine.

Life Science

Poster Number 102: Mattie White

Effect of 1,25 Dihydroxyvitamin D on Cell Cycle Regulation in Transformed MCF10A Human Breast Epithelial Cells

Breast cancer is the second most common cancer among women in the United States. The active form of vitamin D, 1,25-dihydroxyvitamin D, is proposed to inhibit cellular processes that may prevent breast cancer. The current studies investigate the effects of 1,25-dihydroxyvitamin D on cellular regulation of various transformed human breast epithelial cells. The addition of 1,25(OH)2D altered the cellular cycle in these cell lines by increasing the number of cells in the G1 phase. The change in cell cyle was analyzed by utilizing flow cytometry with cells grown in sterile culture. The transformed cell lines used included: MCF10a-Ras, MCF10-C1A1, MCF10-Errb2, as well as untransformed cells, MCF10a. This change in cell cycle regulation may be associated with apoptosis. These findings suggest that 1,25(OH)2 vitamin D may alter the regulation of the cellular cycle in these transformed human breast epithelial cells which may be linked to alterations in apoptosis.

Life Science

Poster Number 103: Jieqiong Zhou

Effect of Long-term alcohol consumption on cognitive function in Chinese men

Long-term alcohol consumption can result in cognitive deficits, including in activities such as acquiring, retrieving, storing and applying information. We did a cross sectional study of 32 Chinese males with an average age of 47 from the manufacturing facility. Questionnaires were used to assess their drinking history, we divided them into groups (non-drinking/≤20 years of drinking/>20 years of drinking). Participants also completed the cognitive function tests (animal naming, fruit naming, and smell identification). We compared the average tests scores between non-drinking vs. ≤20 years of drinking, or >20 years of drinking, using the student t-test. Overall, there is a slight decline in cognitive function average test scores among long-term drinkers vs. non-drinkers. However, these differences were not statistically significant. For animal naming, the p-value comparing non-drinkers to ≤20 years was 0.89, and comparing non-drinkers to > 20 years was 0.71. For fruit naming, these values were 0.86 and 0.39. For smell identification test, these values were 0.78 and 0.27. These results suggest there may be a dose-response relationship between drinking years and cognitive function. It's possible that age or education are influencing these results, further analysis of this will be completed.

Life Science

Poster Number 106: Emily Rantz

Effects of Oxytocin and Carbetocin on Acquisition of Fear Potentiated Startle (FPS) in High- and Low-Alcohol Preferring Mice

There has been an increased interest in investigating the effects of oxytocin and an oxytocin receptor agonist, carbetocin, as potential therapeutic treatments for anxiety-related disorders. The purpose of the present study was to explore the effects of two drugs, carbetocin and oxytocin, on the acquisition of fear potentiated startle (FPS) in high- and low-alcohol preferring male and female mice.

Life Science

Poster Number 107: Erin Kay

Expression of Prion Protein (PrPC) in Brain Barrier Cells and Neurons: Implications in PrPC Function

Prion protein (PrP) is known to play a pathogenic role in prion disease, an infectious spongiform encephalopathy typically seen in “mad cow” disease or prion protein scrapie (PrPSc). The natural function of cellular prion protein (PrPC) is thought to be a Cu-binding protein with potential role in cellular Cu transport and uptake. While located ubiquitously throughout the brain, the presence and relative abundance of PrPC in the blood-cerebrospinal fluid (CSF) barrier (BCB) (where Cu is transported in/out of the CSF) compared to neuronal cells were unknown. This study was designed to test the hypothesis that PrPC may play roles in metal uptake; therefore we would expect to find a higher PrPC expression in BCB cells over neuronal cells. A Z310 choroidal epithelial cell line and a N27 dopaminergic cell line were chosen to compare the expression levels of mRNAs encoding PrPC by using qPCR. Further, we treated the cells with 250 M $MnCl_2$ for 24 hours and studied if Mn treatment affected PrPC expression. Our data showed that in control cells and Mn treated groups, there was a two-fold greater expression of PrPC in N27 cells (Cq: 0.050+0.011) compared to Z310 cells (Cq: 0.021+0.006) ($p<0.001$, $n=6$), suggesting that the dopaminergic cells contained the higher amount of PrPC than brain barrier cells. Mn treatment did not affect PrPC expression in either cell type. These findings suggest that PrPC seems unlikely to play a major role in metal transport in and out of the CSF, but may have a Cu-regulatory role in neurons.

Life Science

Poster Number 108: Leeah Reidenbach

Expression of RNF14 is Consistent During Embryonic Development of Zebrafish with Expression Only Changed at 72 hpf by Atrazine Exposure

Atrazine is a pesticide that is applied to crops. The pesticide is commonly applied in the Midwestern United States. Atrazine gets into water sources like groundwater and streams by rainfall washing the atrazine from fields. Atrazine is expected to be an endocrine disrupting chemical based on laboratory studies. The United States Environmental Protection Agency (EPA) sets the Maximum Contaminant Level (MCL) at 3 parts per billion (ppb) in drinking water, but even these levels are suspected to cause adverse health effects. Atrazine may affect genes. Zebrafish are used in gene expression studies due to their small size, low cost, many offspring, fast growth, embryos developing ex utero, and similar genetic structure to humans. RNF14 is a gene that interacts with the androgen receptor. When expression of RNF14 is increased it is expected to cause abnormal cell growth and lead to carcinogenesis. Studies indicate overexpression of RNF14 is associated with prostate cancer. Previous studies in our laboratory have shown that RNF14 increases in expression after an embryonic exposure to atrazine through 72 hours post fertilization (hpf). The purpose of this experiment was to first determine how RNF14 expression changed over a developmental time course during embryogenesis Second, RNF14 expression was assessed following atrazine exposure at multiple developmental time points. Both experiments used the zebrafish model. The developmental time course at 24, 36, 48, 60, and 72 hpf showed no significant change in RNF14 expression throughout the developmental time course ($p=0.2431$; $n=6$). In addition, gene expression was not changed at the additional developmental time points after atrazine exposure investigated to date including 36 hpf ($p=0.3905$; $n=6$), 48 hpf ($p=0.8840$; $n=6$), and 60 hpf ($p=0.6302$; $n=6$). The data thus far shows that the RNF14 expression is steady throughout embryogenesis and that changes caused by atrazine exposure only occur at the time point of 72 hpf.

Life Science

Poster Number 110: Courtney Oare

Grey Matter Changes and Associations to Motor Impairment in Parkinson's Disease

Parkinson's Disease (PD) is a progressive neurodegenerative disease with common symptoms including impaired motor control, and cognitive dysfunction. While certain medication can alleviate some symptoms, no treatment exists that can slow the progression of the disease. Therefore there is a great need for a biomarker that is associated with disease progression. Recent data indicates that grey matter (GM) atrophy in the limbic system and cerebral neo-

cortex is related to the presence of PD. / / In this study, we used MRI and voxel-based morphometry to investigate GM density changes and their association with progression of motor impairment in 24 PD and 44 control subjects. T1-weighted whole-brain MRI images were acquired on a 3T Philips MRI scanner. GM density was calculated by SPM12. Group difference in GM density between PD patients and controls, and associations to motor dysfunction (measured by UPDRS-III) were examined by two-sample t-test and multiple regression, respectively. / / PD patients show a significant decrease of GM density in the frontal lobe ($p < .001$) with respect to controls, which reflects the well-established cognitive dysfunction in PD. Furthermore, low motor performance (high UPDRS-III score) correlates with lower GM density in the parietal lobe, partially in the motor cortex, and bilaterally in the frontal lobe ($p < .001$). The parietal lobe corresponds to language processing and the latter association is in line with the progression of impaired voluntary movements. Overall, non-invasive measurement of GM density appears to be a good biomarker for progression of neurodegeneration and its associated symptoms in PD.

Life Science

Poster Number 111: Claire Tighe

Hearing Conservation in Purdue University Bands

Hearing Conservation in Purdue University Bands / / Claire Tighe1 Undergraduate, Heath Bentley, IH, Graduate Student1 / 1School of Health Sciences, College of Health and Human Sciences, Purdue University / / Musicians can experience long-term hearing changes from noise exposure during their careers. This noise exposure comes not only from their own instruments but also from those around them and consequences of exposure can include hearing loss, tinnitus, hyperacusis, and diplacusis. In addition, certain musical instruments have higher exposure levels than others including brass and percussion instruments. Based on this information, the hypothesis of this study was to test if the noise exposure levels of Purdue staff and students in the Purdue University bands was above the standard OSHA TWA of 85 dB. Testing involved band members and staff wearing noise dosimeters for the duration of a performance or rehearsal on two different occasions. Analysis of the data showed that both students and staff were over the standard noise level on various occasions during the testing with one exposure level being as high as 101.8 dB for the 8-hr TWA. Moreover, noise exposure levels were also found to be dependent on the venue the band played at, and for students, the instrument they were playing. The results from this study suggest band staff and student enrollment in a hearing conservation program would be beneficial as well as the need for encouragement to wear hearing protection while playing. /

Life Science

Poster Number 114: David Putt

Laboratory Evaluation of a Market-available Scavenging System, using Bioluminescence Techniques, to control Airborne Pathogens among Healthcare Workers in the Post-Anesthesia Care Unit (PACU)

Objectives: This pilot study, using bioluminescent bacteria, will help us better understand how well the market available scavenging system works, where the bacteria are deposited, where there are potential leaks, and if the scavenging system can be improved. / / Methods: Experimental set up and protocol for the capturing of bioluminescent pathogens in a laboratory setting includes setting up and using the head of a "manikin" to generate a bio-aerosol that simulates droplet and droplet nuclei transmission as a patient would when recovering shortly after surgery. Systems will generate, detect and record bioluminescent bacteria for qualitative and quantitative analyses with and without the market-available scavenging system and HEPA filter. / / Results: 10 out of 12 scavenging system trials resulted in impinger bacterial counts below experimental detection limits, which represent a greater than 90%, 99%, 99.9% and 99.99% as compared to the oxygen mask, surgical mask, nasal cannula and controls respectively. Based on bioluminescent imaging data, a large amount of bacteria was observed on the interior of the scavenging system mask and tube, as well as the front (mask side) of both the HEPA and regular filters. / / Discussion: Based on microbial count rate, the scavenging system was most effective at preventing escape of bacteria. By design, this scavenging system should perform well in clinical settings in controlling and containing the spread of pathogens in the PACU and related healthcare settings. This will offer better patient and healthcare worker safety from transfer of microorganisms, blood or bodily fluid and airborne particulates between patient and healthcare workers. /

Life Science

Poster Number 115: Claire Wilson, Madison Baker

Manganese and Iron Blood Concentrations: An Occupational Study

Metallic manganese and iron are mainly used in steel production and also in carbon-steel and stainless steel. They are essential nutrients; however chronic (long-term) exposure to high manganese or changes in a manganese/iron ratio may result in central nervous system problems; it is possible that inflammation may be a first step in this process. This study focused on how these metals may affect C-reactive protein, hemoglobin, hematocrit, and white blood cells (WBC). We conducted a study of 25 workers in Lafayette, IN. A clinical laboratory performed a complete blood count; metal content was measured using ICP-MS. Manganese

and iron were classified as “high” or “low”, using the average measurement as a cutoff value. Average WBCs among those with high manganese was 7.7 k/cumm (standard deviation: 1.1 k/cumm) and among low manganese this was 8.4 k/cumm (standard deviation: 2.3 k/cumm). Among those with high iron, average WBCs were 8.5 k/cumm (standard deviation: 2.4 k/cumm) and with low iron this was 7.8 k/cumm (standard deviation: 1.5 k/cumm). However, these differences were not statistically significant. In the near future, we are looking to finish our analysis of other metals and combine this data with additional study information to write a paper. /

Life Science

Poster Number 117: Natalie Lamport

Optimization of histopathology protocols to track radiation brain injury

The goal of this project is to optimize a combination of histology and immunohistochemistry protocols that is most appropriate for studying mouse brain injury. These protocols will be applied to determine the extent of injury over time in a model of radiation brain injury generated with a clinical linear accelerator (LINAC). For this experiment, normal BALB/c mice were euthanized at 5 weeks of age and their brains extracted and fixed in paraformaldehyde. The brains were then sent to the Purdue Histology Laboratory to be processed into 5um thick coronal slices. We performed histological stains including hematoxylin and eosin, and cresyl violet and eosin, as well as immunohistochemistry for astrocytes (glial fibrillary acidic protein) and white matter (myelin basic protein). An Evos-XL light microscope fitted with a 2x objective was used to evaluate these stains; this was especially suitable for the project because it allowed us to capture the whole brain in one frame. This aided in visualizing structures within the context of the whole brain, and in the future, this will allow us to identify the location of injury in reference to other structures. We can also compare the images of these slides to in vivo magnetic resonance imaging (MRI). Furthermore, we acquired high resolution (40x) pictures of neuronal areas of interest of these stains to ensure the specificity of the stains to the predicted corresponding structures. Using results from these studies, we hope to establish ground-truth paradigms to validate future findings in MRI and track neuronal injury due to radiation.

Life Science

Poster Number 119: Austin Stack

Resveratrol Epigenetically Silences Genes with Oncogenic Functions in Liver Cancer Cells

DNA hypomethylation was previously implicated in cancer progression and metastasis. The purpose of this study was to examine whether resveratrol, thought to exert anti-cancer effects,

target genes with oncogenic function for de novo methylation and silencing. / Human hepatic adenocarcinoma SkHep1 cell line and human untransformed hepatocytes were used as experimental models. Following expression analysis by QPCR of selected genes with oncogenic function, pyrosequencing was performed to assess DNA methylation of selected loci. / These analyses reveal that resveratrol downregulates genes functionally involved in cancer development and progression, including MMP2, TET1, S100A5, and PLAU. Reduction of TET1 transcriptional activity coincided with increase in DNA methylation within TET1 CpG island shore. The increased DNA methylation occurred within a CpG site that is in immediate proximity of motifs for OCT1. This raises a possibility that DNA methylation may disturb in binding of the transcription factor to TET1 regulatory region and subsequently silence expression of the gene. / Our results propose a role for DNA methylation in regulation of oncogenes in liver cancer in response to resveratrol. We deliver a novel insight into regulation of genes with oncogenic function and provide support for epigenetic-targeting strategies as an effective anti-cancer approach. /

Life Science

Poster Number 120: Lauren Price

Status epilepticus triggers accumulation of C1q hippocampal dendrites and in the blood-brain-barrier in a rat model of acquired epilepsy

Prolonged seizures (status epilepticus; SE) increase the risk of future unprovoked recurrent seizures (epilepsy). Neuropathological changes underlying epileptogenesis following SE include injury to the hippocampal neurons and dendrites/spines along with damage to the blood-brain-barrier (BBB). A candidate mechanism underlying these changes is the complement system, a major effector in the innate immune response. This signaling cascade consists of complement proteins (>30) that are membrane receptors and ligands which can “tag” cells structures for microglia to find and eliminate. Evidence suggests that the complement C1q of the complement classical pathway mediates dendritic spine elimination in the uninjured brain and disruptions in the BBB following neurotoxicity. Thus, we hypothesized that SE triggers accumulation of C1q protein in spines and along the walls of the blood vessels in the hippocampus that precede the damage of these structures. To test our hypothesis we used a rat model of SE and acquired epilepsy. SE was induced with pilocarpine and stopped after 1 hour with diazepam. Controls were given saline. We used immunofluorescence with antibodies specific for C1q along with neuronal, dendritic, endothelial, and microglial markers in brain tissue collected at 4 hrs, 1-, 3- and 14-days after SE. Our preliminary findings indicate increased accumulation of C1q protein in hippocampal dendrites at 3- and 14-days post-SE compared to controls. C1q immunostaining was also observed in the walls of the blood vessels of both control and SE groups. Studies are

ongoing to further examine the role of C1q in hippocampal dendritic remodeling and BBB leakage in epilepsy.

Life Science

Poster Number 121: Samantha Colin

Status epilepticus triggers acute hippocampal-dependent memory deficits in a rat model of acquired epilepsy

Temporal lobe epilepsy (TLE) is characterized by recurrent unprovoked seizures and hippocampal-dependent memory deficits. Current antiepileptic drugs fail to suppress seizures in 20-40% of epileptic individuals and are largely ineffective at attenuating comorbid cognitive conditions. In order to identify and understand the mechanisms underlying cognitive deficits associated with epilepsy it is required that hippocampal-dependent memory impairments are replicated in experimental models of epilepsy. Thus, in this study we determined whether hippocampal-dependent spatial and recognition memory deficits were present in a rat model of acquired epilepsy. We used a rat model of status epilepticus (SE) and acquired TLE. An episode of SE was induced with the chemoconvulsant pilocarpine and stopped after 1 hour with the anticonvulsant diazepam (SE, n=10). Controls were given saline (control, n=11). Two weeks later, the Novel Object Recognition (NOR) test and Barnes Maze (MB) were used to assess recognition and spatial memory, respectively. We found that control rats spent more time exploring a novel object compared to a previously explored familiar object suggesting an intact memory in the NOR test. In comparison, rats from the SE group showed a significant deficit in remembering the familiar object ($p<0.05$). In the BM, control rats trained to find an escape box localized on a circular open-field were able to learn its location while SE rats showed a significant deficits in learning the location of the escape box ($p<0.001$). Our data suggest that one episode of SE triggers acute hippocampal-dependent memory deficits that are evident as early as two weeks post-SE.

Life Science

Poster Number 122: Owen Densel

Supplementation of Alpha-Linolenic Acid in SH-SY5Y Neuroblastoma Cell Culture

The omega 3 fatty acids Alpha-Linolenic Acid (ALA), EPA and DHA are known to be present in the brain; however DHA is much more abundant than ALA and EPA (1). Additionally, ALA and can be converted to EPA and DHA through the enzymes Δ6 desaturase, elongase, Δ5 desaturase, and through Sprecher's Shunt, however this conversion rate is low, with less than 8% of ALA being converted to EPA, and less than 4% of ALA being converted to DHA (1).

Because of the small amount of DHA and EPA found in adipose tissue, storage is limited for these fatty acids and continuous dietary intake is required to maintain adequate levels in tissues (1). An insufficiency of omega-3 fatty acids has also been linked to depression due to their role in the development and function of the central nervous system (3). A review has shown that noradrenaline is important in the regulation of depression; possibly due to the neurotransmitter's role in the regulation of cognition, motivation, and emotions (2). An insufficiency of omega-3 fatty acids has also been linked to depression due to their role in the development and function of the central nervous system (3). Treatment of differentiated SH-SY5Y cells, a validated cell culture model for studying neuronal function (4), with the omega-3 fatty acid DHA was shown to increase both basal noradrenaline, whereas the omega-6 fatty acid arachidonic acid (AA) showed no effect (5). These results suggest a possible explanation for how omega-3 fatty acids status might impact depression. However, Alpha-Linolenic Acid, has not yet been investigated for its effect on basal noradrenaline in cell culture, and thus its potential role in regulating depression. Therefore, a method has been developed to supplement the SH-SY5Y cell line with Alpha-Linolenic Acid in order to investigate this question.

Life Science

Poster Number 124: Matthew Winchester

The Effects of an Omega-6 Dominant or Omega-3 Enriched Diet on Anxiety Behavior in Adulthood

Increasing attention has been drawn to the Western diet and the consequences it may have over the life span. The ratio of essential fatty acids in the diet have been investigated as a potential health concern. The objective of this study was to see how prenatal and perinatal exposure to a Western-style omega-6 dominant diet or an omega-3 enriched diet would influence anxiety behaviors in adulthood. Pregnant Sprague Dawley rats were fed one of these two experimental diets during pregnancy and lactation, and the offspring were weaned onto a standard chow diet. In adulthood, the offspring were tested in the Elevated Plus Maze, the Open Field Test, and the Forced Swim Test. No significant differences were found between groups. Therefore, the ratio of omega-6 and omega-3 fatty acids in the prenatal and perinatal diet do not appear to influence anxiety behaviors in adulthood.

Life Science

Poster Number 127: Alyce Baron

Trichloroethylene Exposure in Embryonic Development

Trichloroethylene (TCE) is primarily used as a vapor degreaser for metal parts, but now it is being detected in the ambient air levels and the ground water. In fact, it is the most frequently reported organic groundwater contaminant. The purpose of our research was to learn more about the effects this chemical could have on embryonic development, and at what concentrations these effects would be seen. We used zebra fish embryos, which were dosed with concentrations of TCE varying from 0.5 ppb to 500 ppb, with a control of plan fish water. The embryos were exposed to these chemicals for five days while they were hatching. We also dosed with 1-trichloromethyl-1,2,3,4-tetrahydro-beta-carboline (TaClo) and Apomorphine, but for shorter amounts of time because of the lethality of these chemicals. We then analyzed the behavior and swimming patterns of these fish and performed statistical analysis to obtain our results.

Life Science

Poster Number 128: Madison Baker, Claire Wilson

Zinc and Lead Blood Concentrations: An Occupational Study

Heavy metal exposure has been known to cause impairment of neurological function in occupational settings. For instance, welders have higher exposure because of the heavy metals present in their work environment, which may cause this impairment. Neurologic issues may result from long-term inflammation. In this study, we collected blood samples from 25 welders of the Lafayette, IN area to determine the concentrations of Zn and Pb in their blood using ICP-MS. C-reactive protein (CRP), an indicator of inflammation, was analyzed at a clinical laboratory. Zinc and lead were classified as “high” (above average) or “low” (below average). We determined the correlations of the metals with CRP , and analyzed these using a t test. CRP concentration among those with high Zinc was 4.9 mg/L (standard deviation 6.9 mg/L); among those with low Zinc this was 3.2 (6.0). Similarly, CRP among those with high Lead was 6.7 (9.0) and for low Lead was 3.0 (5.2). CRP appears to be higher in those exposed to Lead than to Zinc; however, these were not statistically significant differences. Data collection and analysis for this project is going to continue; these should be considered preliminary results. / /

Life Science

Poster Number 237: Stasa Tumpa, Ayat Abourashed

Dissecting MDM2 Function in Skeletal Muscle Development and Disease

Disruption of normal skeletal muscle development or homeostasis can result in poor muscle composition and overall health, or in rhabdomyosarcoma, the most common childhood sarcoma. Prior studies have implicated MDM2 in the regulation several key proteins including MyoD and FOXO1 that are critical for myogenesis, the process by which muscle is formed. Despite these initial observations, the role of MDM2 in the regulation of myogenesis remains to be determined. As constitutive deletion of Mdm2 results in embryonic lethality early in development, we have exploited a hypomorphic allele of Mdm2 that expresses reduced amounts of wild-type MDM2 RNA and protein to examine MDM2 function in myogenesis. Our quantitative and qualitative analyses have revealed a decrease in overall muscle fiber size and shift toward an increase in fast twitch fibers in muscle from MDM2-deficient mice. Data from the quadriceps muscle indicates that loss of MDM2 results in an increase in centrally located nuclei in muscle fibers, suggestive of an increase in degeneration/regeneration. Additionally, we observed an increase in TUNEL-positive staining in the quadriceps muscles of MDM2-deficient mice, indicating that loss of MDM2 results in an increase in the apoptosis of muscle fibers. Together, our studies support a role for MDM2 in muscle cell survival and homeostasis.

Life Science

Poster Number 90: Courtney Winters

A Descriptive Analysis of the Appropriate Use of Cognitive Bias Terminology in Forensic Science Literature

Cognitive bias occurs without a person's awareness and can affect decision-making abilities. In forensic science, bias can be especially detrimental to making accurate decisions about the evidence in a criminal investigation. There are many academic studies in identifying, describing, and suggesting ways to mitigate cognitive biases in forensic science. Many authors will give a known cognitive science concept a new name or create their own bias. This is a problem in the literature because nobody knows for sure how many published studies are referring to or testing the same phenomena since authors are using different definitions or terminology to describe the same concept. This study systematically identified bias terms that different domains of research use when conducting forensic science research. After identifying the bias term(s) used in each study, each error was categorized by domain (e.g., psychologists, lawyers, forensic scientists), by type of bias (e.g., confirmation bias, anchoring bias, made up bias term) and how the authors define the bias term (i.e., correct definition, incorrect definition, no

definition, or made a new definition). Overall, this study shows that authors were more likely to use a correct bias term and bias definition (29%) than make up a bias term and bias definition (25%.) A majority of the authors in this study are not cognitive scientists and, therefore, are not heavily trained in cognitive terminology. The issue of the incorrect use of cognitive bias terminology is a serious one for forensic science and has yet to be noted or investigated until this preliminary analysis. The responsibility for forensic scientists who are not trained in cognitive science to understand the bias literature and to adopt the correct terminology is fundamental for proper communication among scientific professionals.

Social Science/Humanities

Poster Number 91: Anoop Javalagi

A Meta-Analysis of Protean and Boundaryless Careers Predicting Employee Withdrawal

Due to volatile employment conditions, employees today more often adopt protean and boundaryless career attitudes (PCA and BCA), which are individualized approaches to career management. While PCA and BCA are conceptually associated with reduced employer loyalty, they have rarely been investigated in relation to job withdrawal. Based upon a meta-analysis of the PCA and BCA literature, we investigated the associations between PCA and BCA and withdrawal outcomes (i.e., job search and turnover intentions). Then, we tested a theoretical model using path analysis wherein PCA and BCA lead to withdrawal outcomes via two mediating mechanisms: organizational commitment and perceived employment opportunities. PCA was unrelated to job search and turnover intentions, whereas BCA was positively associated with job search and turnover intentions (although the positive relationship between BCA and turnover intentions did not hold in all cases). Organizational commitment mediated the relationship between the self-directed dimension of PCA and turnover intentions and between the organizational mobility preference dimension of BCA and turnover intentions. Furthermore, perceived employment opportunities mediated the relationship between the self-directed dimension of PCA and job search and the relationships between BCA and turnover intentions. Taken together, these findings reveal that BCA is more likely to lead to withdrawal outcomes via both reduced organizational commitment and increased employment opportunities.

Social Science/Humanities

Poster Number 92: Jessica Gundlach

A Psychophysiological approach to examining Person-Thing Orientation

Person Orientation (PO) and Thing Orientation (TO) are orthogonal individual difference measures that asses how people selectively orient their attention to stimuli around them. Some individuals pay more attention to people in their environment (PO), while others pay more attention to the objects (TO) (Graziano et al., 2012). Previous literature has shown these traits to be highly associated with career interests and personality traits, with significant gender differences as well (Graziano et al., 2011). It is unknown, however, how PO/TO disposition maps onto the activation of the brain's attention network in response to salient stimuli. The present study hopes to demonstrate that PO/TO disposition will modulate the late positive potential (LPP), a neural indicator of selectively sustained attention to motivationally salient stimuli. Data will be collected from 50 participants (N=32 as of 2/22/16). Participants will complete a passive viewing task while electroencephalogram (EEG) data is being collected. In this task participants will view three categories of images: people, things, and ambiguous stimuli. Images for this task were selected using data from a pilot study, in which participants reported scores of how well images represented the categories of both 'things' and 'people.' Ambiguous images selected were those that had high scores on both person and thing ratings. Of interest is how LPP amplitude elicited by these three types of stimuli will map onto self-reported PO/TO disposition.

Social Science/Humanities

Poster Number 98: Isaac Nutter

Clinic Data Analysis

his study is an analysis of the Purdue Psychology Treatment & Research Clinics (PPTRC)'s archival data collected from September 2011 to September of 2015. Treatment measures included CORE-Outcome Measure (CORE-OM) (completed at every session by client) and Five-Factor Model Rating Form (FFMRF) (completed at every fourth session by client and therapist). The goal of this analysis was to provide information about the clinic's effectiveness in patient outcome and to investigate how FFM personality traits relate to the outcomes of psychological treatment. This study also examined the rate of client and clinician agreement through time.

Social Science/Humanities

Poster Number 99: Rebecca Thompson

Correlating Early Mathematics Skills at Different Ages in Preschool Using Targeted Home Numeracy Environment Practices

The home numeracy environment (HNE; parent-child math-related practices at home) is a particularly influential contributor to the development of children's early numeracy skills. However, research findings regarding this relation have been equivocal in preschool. As the mathematics skill set of children is rapidly changing during the preschool years, the same parent-child practices likely are not equally related to children's math performance across preschool ages. As such, it is hypothesized that (1) parents engage in more advanced HNE activities with older preschool children and (2) more basic HNE activities will be related to mathematics performance for younger preschool children, and more advanced HNE activities will be related to mathematics performance of older preschool children. To examine these hypotheses, 184 preschool children (53% female) were assessed on their early mathematics skills. Their parents also completed a survey on parent-child mathematics-related practices. Results indicate that parents engage in more complex math activities with 4-year-olds overall, and specifically for the following practices: printing numbers, using number activity books, learning simple sums, counting out money, sorting things by size, shape and color, and talking about money while shopping. Further, the broad measure of HNE activities was correlated with math performance at four, but not at three, years of age. However, more basic activities such as counting objects and using the terms "more/less" were related to mathematics performance in 3-year-olds, and more complex activities such as counting down, learning simple sums, and identifying names of written numbers were related to math performance of 4-year-olds.

Social Science/Humanities

Poster Number 100: Alyssa Nowakowski

Depression and Exchanges of Support Amongst LGB and Heterosexual Midlife and Older Adults

Depression affects approximately 14.8 million American adults aged 21 and older. Studies on midlife and older adults have shown that support from a partner can help buffer the affects of depression. Using data from the second wave of the Survey of Midlife Development in the United States (MIDUS 2) this study had two primary aims. The first aim was to compare the prevalence of depression between LGB and heterosexual midlife and older adults. The second aim was to examine the association of having depression and exchanges of emotional support between the two groups (LGB and heterosexual) older adults. A total of 108 LGB identifying

individuals and 3776 heterosexual individuals participated in MIDUS 2. As anticipated, LGB individuals more often were depressed compared with heterosexual individuals. (15% and 10% respectively, chi-square = 2.17, $p < .09$). However, contrary to our expectations, exchanges of support did not differ between either LGB or heterosexual individuals who were depressed and those who were not. Additional analyses revealed that heterosexual individuals reported giving more emotional support to their partners then did LGB individuals $F(1,3621) = 6.87$, $p < .01$; and, heterosexual individuals almost reported receiving more emotional support from their partners than did LGB individuals, $F(1,3640) = 5.45$, $p < .05$. Our findings suggest that interventions for LGB couples' that promote exchanges of emotional support may be protective for their health and wellbeing, and such interventions may be beneficial for both LGB and heterosexual couples dealing with depression.

Social Science/Humanities

Poster Number 104: Amy Barton

Effects of Animal Assisted Activities in the Inclusion Classroom

Guinea pigs have been shown to improve social functioning in children with Autism Spectrum Disorder (ASD) in the inclusion classroom (O'Haire, McKenzie, McCune, & Slaughter, 2014). The present study investigates if these same effects are seen in typically developing (TD) children in the inclusion classroom. / Children across several schools and classrooms were divided into groups of three: two TD children and one child with ASD. These groups either interacted with two guinea pigs or a standardized set of toys. All sessions were video recorded for later behavioral coding. Coded behaviors include: emotional display, joint attention behaviors, problem/aberrant behaviors, and social withdrawal behaviors. One score for each type of behavior was given per minute, and averaged across child and context. / Using hierarchical linear modeling, we found that typically developing children smiled and laughed more in the presence of the animals compared to toys. Guinea pigs can improve the experience of both children with ASD and TD children in the inclusion classroom. Future studies may include year-long studies across several classrooms in order to show long-lasting effects or studies including different animals. / O'Haire, M., McKenzie, S., McCune, S., & Slaughter, V. (2014). Effects of classroom animal-assisted activities on social functioning in children with autism spectrum disorder. Journal of Alternative and Complementary Medicine, 20(3).

Social Science/Humanities

Poster Number 105: Haley Brower

Effects of ostracism and over-inclusion on ERPs, reward sensitivity, and self-esteem

Depression is one of the most common and costly mental illnesses faced by individuals and society. The chronic experience of ostracism can lead to a sense of helplessness and depression due to a "giving up" response. Previous electroencephalogram (EEG) research has shown physiological differences between inclusion and exclusion events, which are correlated with self-reported distress levels. Other research has shown that depressed individuals exhibit a blunted response in event-related potentials (ERP)s to non-rewards vs. rewards, indicating a deficit in positive affect. This study tests the effect of ostracism on reward functioning and whether the effect will be larger among depressed individuals. / / Sixty-one undergraduate students (Mage = 19.53, SD = 1.28 ; 26 = female) participated in this study. Symptoms of depression were measured using the Depression Anxiety Stress Scale (DASS-21). EEG data was recorded while participants completed a gambling task and Cyberball on a computer. For the gambling task, participants opened a virtual door and won (or loss) money fifty percent of the time. Cyberball is a well-established ostracism paradigm where participants play a virtual ball toss game with computer-generated others, but believe they are playing with other participants. / / This research aimed to replicate previous findings of EEG Cyberball studies. We also predicted that ostracism would blunt the response to monetary rewards. Further, we predicted that more depressed individuals would have blunted reward sensitivity after experiencing ostracism. Finally, we were interested in whether over-inclusion would result in ERP plasticity.

Social Science/Humanities

Poster Number 109: Jami Eller

Getting couples to manage attachment insecurity: Potential strategies and pitfalls

Attachment insecurity can make it difficult to maintain an intimate relationship. The current research examines strategies that a relationship partner can adopt to help their insecure partner become more secure and protect the relational bond. Unique and novel partner strategies are being developed, with target specific dimensions of insecurity: attachment anxiety v. avoidance. Findings will be reported from a study with couples in which a target person is relatively insecure and the partner relatively secure. In an experimental condition, secure partners are trained in strategies for interactions in which their insecure counterpart is dealing with a relational issue. The strategies are matched to address the insecure person's anxious or avoidant tendencies. Control partners will not be trained in such strategies. Each

couple will participate in a five minute discussion focused on the insecure target's issues, during which the relatively more secure partner, if in the experimental condition, will be asked to employ the trained communication strategies. Following each discussion, couples will be individually assessed as to felt security, emotions, and experiences during the discussion task. We hypothesize that insecure targets will report less immediate distress and greater momentary security if their partner adopts the experimental strategies, relative to targets whose partners are in the control condition. If these communication strategies are effective at lowering immediate distress and enhancing state attachment security, then prevalent insecure tendencies may be manageable over time by an attachment figure, particularly by a romantic partner. This management can allow for possible avenues to work with insecure individuals on increasing attachment security and improving relationship maintenance and quality over time.

Social Science/Humanities

Poster Number 113: Yusuke Yamamoto

Interactive Role of Alcohol Intoxication and Aggressogenic Personality Traits on Aggression in Ostracized Individuals

While the link between alcohol consumption and aggression has been well established, alcohol consumption does not always lead to aggression. Extensive research has aimed to identify moderators and/or mediators that influence the alcohol-aggression relationship. For instance, studies indicated that personality traits have shown to predict aggression such that agreeableness and trait aggressivity predicted intoxicated-aggression (Miller, Parrott & Giancola, 2009). Furthermore, ostracism research has indicated a strong link between social exclusion and anti-social behaviors such as aggression (i.e., Twenge, Baumeister, Tice & Stucke, 2001; Wesselmann et al., 2010). While many studies have emphasized the effects of personality traits and ostracism strongly predicted aggression, limited research has looked at an interaction role between the two factors on intoxicated-aggression. / Current study is conducted to fill the gap in the literature. In the study, participants aged above 21 recruited from a mid-western community will be randomly assigned to either receive an alcoholic, placebo or non-alcoholic beverage. Following beverage administration, participants will play an online virtual ball tossing game (i.e., Cyberball) in which the fictitious players will ostracize the participant from the ball-tossing activity. After the Cyberball task, participants will then compete against one of the fictitious players in Taylor Aggression Paradigm (TAP), a competitive reaction time game that will give participants the opportunity to engage in (as well as receive) aggression via sound blasts. After the experiment, participants will be carefully debriefed and detox procedure to be followed.

Social Science/Humanities

Poster Number 116: Erin Moorman

Nomological Network of Openness and Psychoticism

Section III of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) proposed a new dimensional way of diagnosing Personality Disorders. This new model allows for Personality Disorder diagnosis at least partially based on 25 maladaptive trait dimensions that can be sorted into five broad domains. In various studies these five domains of pathological traits have shown explicit connections with the five domains of personality in the Five Factor Model. The largest and most common inconsistencies in research of this kind have existed between the relationship of the Five Factor domain of Openness and the Personality Inventory for the DSM-5 domain of Psychoticism. The current study aimed to clarify the nature of the relationship between Openness and Psychoticism by investigating aspects of the nomological network of Openness. Participants completed a variety of measures assessing Openness, Psychoticism, and different aspects characteristic of high Openness including intelligence, positive schizotypy, and creativity on an online data collection platform. Some participants completed a supplementary measure of creativity in a lab setting. Additionally, permission was obtained from the Office of the Registrar to access all participant's academic records. The relationship between Openness, Psychoticism, and the aspects characteristic of high Openness will allow for a better understanding of how Openness relates to maladaptive personality and Personality Disorder diagnosis. /

Social Science/Humanities

Poster Number 118: Marguerite Lamborn

Personality and Social Support in Romantic Relationships

Personality disorders (PDs) are characterized by enduring patterns of inner experience ad behavior that deviates from the expectations of an individual's culture. PDs, by nature, are associated with deficits in relating to other people. Previous research has indicated that individuals who possess personality psychopathology have an increased risk of experiencing dissatisfaction in their romantic relationships. Also, previous research investigating social support from friends or family members suggests that perceiving high levels of social support can decrease different psychopathology symptoms. However, there is limited research in the area of social support and PDs, specifically how they might interact with marital satisfaction. In the current study, we plan to examine how social support mediates the association between personality psychopathology and marital satisfaction, particularly at waves two and three. The Dyadic Adjustment Scale (DAS) was used to assess the participants' marital satisfaction at all

three waves. Personality psychopathology was measured using the Schedule for Adaptive and Nonadaptive Personality-2 (SNAP-2). We measured friend and family support from the Perceived Social Support Friend/Family scale. We expect the results will indicate a negative correlation between personality disorder traits, perceived levels of social support, and relationship satisfaction. In addition, we anticipate that quality of social support will be able to explain the link between levels of personality disorder traits and romantic relationship satisfaction.

Social Science/Humanities

Poster Number 123: Nola Daley

The Effect of Retrieval Practice Structure on Learning

Retrieval practice has been shown to be beneficial for learning. Although the benefit of retrieval practice on learning is well established, more research is needed to pinpoint how to structure retrieval opportunities while studying. A possible way to structure retrieval practice is through a cumulative, free-recall procedure. Two experiments aimed to investigate this strategy. In the first experiment, all subjects read an expository text broken into four sections. The retrieval practice structure was manipulated between subjects. A cumulative structure was compared to section recall and study only. For the cumulative structure, subjects were asked to recall all of the material they had seen up to that point each time. Although results support the retrieval practice effect, the prediction that cumulate retrieval practice would provide an additional advantage over section recall was not supported. The goal of the second experiment was to further investigate cumulative retrieval practice by addressing methodological issues from the first experiment and decreasing output interference. In the second experiment, only two sections of text were used. The number of tests and the order of material recalled was manipulated between subjects. Repeated retrieval combined with cumulative retrieval starting with the most recent information was compared to a repeated retrieval combined with cumulative retrieval starting with the past information first and single retrieval groups in both orders. Preliminary results support the prediction that repeated retrieval combined with cumulative retrieval starting with the most recent information benefits learning more than single retrieval or repeated retrieval with the most recent information last. /

Social Science/Humanities

Poster Number 125: Sarika Srivastava

The Effects of IPad Learning Interventions in Children with Typical Development versus Children with Autism

This study aims to investigate the use of different learning interventions among typically developing children and their potential effects for learning skills in children with autism. The sample consists of typically developing children (n=20) ranging from 2-5 year olds. The literature shows that autism by definition encompasses impairments in the sphere of social-cognition. Many studies have magnified the role in inhibited abilities related to social as well as communicative advancement. When looking at specific early social attention impairments in autism, studies have focused on social skills such as social orienting, attention to distress, and joint attention, and have found that individuals with ASD lack skills such as these in typical social situations. The goal of our study is to see if the differences in the two learning mediums (a traditional book versus and IPad) produce an effect on typically developing children and hope to in the future apply the results to a sample of children with autism.

Social Science/Humanities

Poster Number 126: Haojing Zhu

Toward developing counterfactual thinking tendency scale: Initial explorations.

Counterfactual factual thinking refers to thoughts about what might have been, that is, imagined alternatives to past events. Scholars have suggested that counterfactual thinking may play an important role in personality, and decision making. But because no scale that examines the tendency in counterfactual thinking exists, it is hard and complicated for researches to study in this subject. In this study, we develop the Counterfactual Thinking Tendency to measure individual's tendency to engage in upwards versus downwards counterfactual thinking. Exploratory factor analysis demonstrated a four factor structure, which revealed new facets of counterfactual thinking not found in previous studies. A correlation between counterfactual thinking and age was found by using the scale. We also examined individual differences in decision making styles (dependent, avoidant, spontaneous, intuitive, logic) by using General Decision Making Styles Inventory. A relationship between dependent decision making style was found to associate with education level.

College of Liberal Arts

Social Science/Humanities

Poster Number 143: Abigail Chin

Teacher/Student Engagement in Large Active Learning Classrooms

One classroom is a more traditional tiered lecture-like room, the other is more studio like with long counter-height tables. Both classrooms are used for the same first year engineering coursework. Taking data and observing at the different interactions between the professor and students.

Innovative Technology/Entrepreneurship/Design

Poster Number 129: Jennifer Hwang

Doubling Grammars: Mandarin- and Spanish-English Bilingual Children and the so-called Auxiliary Inversion Conundrum

Understanding the process of multilingual acquisition is essential in a diversifying society. Our goal is to model how multiple mental grammars in multilingual children develop. We examine how the first language-L1 affects the subsequent acquisition of English within the natural acquisition window. Park's (2011) PFAM-Hypothesis claims that non-target productions of Auxiliary-Inversion result from the ongoing acquisition of the person feature-[PRS] and the Spell-Out conditions of the C-head. Spontaneous speech of Mandarin-English and Spanish-English speaking children was collected from two age groups (7-9 and 11-14), after a 10-month exposure to English. Videos were transcribed using ELAN and wh- and Y/N-interrogatives were coded for analysis. Of these, 85.7% were target, and 14.3% represented do-support overgeneralization. All [PRS]-values were acquired, indicating further complexity within the final acquisition stage identified by Park (2011). M-E and Sp-E patterns differ in correlation with the behavior of V-to-T in the respective L1: Sp-E present T/V-Doubling absent in M-E, while both groups show spurious do-in-C. We conclude that in both groups [PRS] and [TNS] features are copied from T into C; however, T content differs: in M-E grammar T lacks Aspect, whereas in Sp-E grammar T contains lexical verbs. Consequently, aspectual have coexists with do-in-C in M-E (when did this picture has been taken), while a tensed verb coexists with do-in-C in Sp-E (what does a mummy says…). Human brains have the capacity to create multiple grammars, simultaneously or sequentially. The L1 mediates sequential acquisition without hindrance; however, further research is necessary to fully characterize the intermediate stages.

Social Science/Humanities

Poster Number 130: Lindsay Bean

Comparing Infant and Maternal Mortality in Kenya and the Democratic Republic of the Congo

Looking specifically into ways that organizations are trying to help as well as coming up with my own ideas of how to help reduce rates of infant and maternal mortality. Using ethnographic examples from different areas to use real life evidence of how birthing systems around the world vary from those in the Democratic Republic of the Congo and Kenya. Then looking specifically into Kenya and the Democratic Republic of the Congo and their birthing rituals and how their healthcare systems as well as their living conditions affect birth results.

Social Science/Humanities

Poster Number 131: Allison Kraft

Disbanding the Army of Northern Virginia

Confederate General Robert E. Lee surrendered to Union General Ulysses S. Grant on April 9, 1865 at Appomattox Courthouse, Virginia. Following Lee's surrender, the Army of Northern Virginia disbanded, and soldiers began to make their way home upon receiving their parole papers. I am facilitating Professor Caroline Janney in her research to discover what happened to these men, using online databases to trace their individual stories.

Social Science/Humanities

Poster Number 132: Samantha Brown

History of water legislation

With the recent goings on in Flint, it is important to understand how our government has developed the legislation behind water safety over the course of history.

Social Science/Humanities

Poster Number 133: Grant Owen

Minority Women Contesting Marginalization: Tourism Imaginaries and Place-Making in SaPa, Vietnam

SaPa, a picturesque town in the hills of northern Vietnam, is home to a number of ethnic minorities, with the Hmong people being the most populous. The ethnic tourism industry has brought many Hmong women and girls from nearby rural villages into the town. Here, they

engage in the broad concept of tourism imaginaries to strategize everyday forms of resistance in response to their marginalization. My investigation is drawn from qualitative data collected from ethnographic fieldwork in Southeast Asia that focuses on how Hmong ethnic minority women in SaPa are contesting marginalization imposed on them by Vietnamese society through tourism practices. I examine how Hmong women are challenging Vietnamese domination of the tourism industry in three spaces—rural, cyber, and urban—through the use of tourism imaginaries. Drawing from theories on production of space and place-making, I explain how the women navigate these contested spaces to claim and make a place for themselves. /

Social Science/Humanities

Poster Number 134: Bridget Curry

Past and Present: The History of College Preparation at Purdue

As Purdue moves forward to open the Purdue Polytechnic Indianapolis High School in August 2017, there are high expectations and lofty goals for the STEM pipeline. The school seeks to offer underserved students of Indianapolis a pathway to Purdue and hopes to give them "skills to meet the evolving needs of industry." There has been no mention amidst all the talk that the idea of opening a high school is not new to this university: Purdue has a historic precedent to its Polytechnic High School in the late 1800s. Purdue's Preparatory Department promised to give students skills required to be successful upon entrance to the full university. The Preparatory Department was successful in its first years of existence, and gave many students the opportunity pursue higher education; however, its effected waned and was abolished in June 1894 with a single-line motion by the Board of Trustees. There may be several explanations why the department was deemed unnecessary: perhaps economic struggles at the university forced administrators to cut the department, or maybe high schools improved their academic standards, thus making it possible to eliminate the department. As the university invests into a contemporary counterpart to the Preparatory Department, it is important to remember our past. My research recovers the history of the Preparatory Department and examines the similarities between the Polytechnic High School today and its forerunner in the nineteenth-century. By examining historic success and obstacles, we may better predict the challenges to and successes of the Polytechnic High School today.

Social Science/Humanities

Poster Number 135: Shen Duan

Pregnancy, Birth and Babies: Health Transitions in Rural Mexico

WILKE INTERN / / This research is about the decline about the breastfeeding rates decline in rural Mexico area. I am doing literature reviews for this project. I generate ideas and thoughts about breastfeeding rates decline. One major problem I want to connect is with the social cultural beliefs. Because it is an isolated rural area in Mexico, people have many misunderstandings about nature. This kind of idea contributes to the decline of the breastfeeding. I will research the connections and relationships about the social beliefs.

Social Science/Humanities

Poster Number 136: Lily Anderson

Pregnancy, Birth, and Babies

The rates of ethical concerns and questions surrounding C-sections are rising just fast as the C-section rates themselves and one concern that Dr. Veile and I are particularly interested in is the effect of C-sections on subsequent fertility. Many studies have already established a significant correlation between C-sections and decreased fertility, but as it can be difficult to control for maternal choice and confounding variables, we believe the Maya of Xculoc are an excellent population to serve as a comparison to these studies. After a through literature review and using previously acquired data, we calculated that Maya women who had C-sections were 25% more likely to have a tubal ligation. This an area of continued research, but our current conclusions are that C-sections do not biologically affect fertility, however, they do cause women to limit their own fertility, both consciously and unconsciously.

Social Science/Humanities

Poster Number 137: Austin Keen, Jenna Kuhns

Priming in English and Mandarin Motion Event Descriptions

Languages make use of a common set of conceptual components to express causative motion events (e.g., The man chased the dog into the house), but vary in how the information is structured (Talmy 2000). Mandarin, unlike English, tends to encode Path more prominently, using a series of two or more verbs rather than a single preposition (Ji et al 2011, Slobin 2004). This language production study compares causative motion events in English and Mandarin, asking: (1) To what extent are the concepts, Cause and Path, susceptible to priming from recently-presented sentences? (2) How do language-specific biases affect speakers'

expressions? It is hypothesized that Mandarin speakers will be more sensitive to priming of Path information than English speakers, while the two groups will not differ with respect to Cause. / / In this study, speakers read priming sentences aloud in their native language before they viewed and described video clips depicting different causative events. Priming sentences varied between causative and self-initiated events, and three Path types: complex (containing two verbs/prepositions), simple (containing one verb/preposition), and non-existent. A control condition using non-motion verbs was included. Priming effect was assessed using two dependent variables: Cause mention and Path mention. / / Data were collected from 20 English speakers and 16 Mandarin speakers. The two groups showed no difference in Cause mention. However, Path mention in the Mandarin group showed a significant priming effect due to Path type—an effect which was not found in the English group. These findings support our predictions based on language typology.

Social Science/Humanities

Poster Number 139: Demetrio Ornelas

Pyschoanalysis and Progression in the 20th Century

My research will be based strongly on the developments made on Freud's and Jung's theories on psychoanalysis by two important schools of thought. The new Frankfurt school in Eastern Europe and the contributions made by the first psychedelic researchers such as Hoffman and Stan Grof.

Social Science/Humanities

Poster Number 140: Juan Pablo Loaiza Ramírez

Recycle or Trash Bin? Modeling Students' Recycling Behavior in a Field Study

Do you know where an apple core or a dirty napkin should be disposed? Should they go into a trash bin or into a recycling bin? This question may be easy to answer. However, the decision will be harder when it comes to Ziploc bags and wrappers. Those items are more difficult to dispose correctly and can be often found in the wrong bins. / What affects people's behavior when they dispose items? Our project takes a psychological perspective and aims to understand how people are making recycling decisions in front of the bins, especially if they are in a hurry. Two of the main factors this project focuses on are the distance of appropriate bins and the signage surrounding the bins. We are studying these and other factors inside and outside of buildings on Purdue's campus, and explore how convenience and affordance influence people's recycling behavior. / The convenience hypothesis predicts that the number of misplaced items is a function of the distance of an appropriate bin. We categorized and

mapped bins at 135 locations on campus and calculated the distances between adjacent bins. The convenience hypothesis predicts that we will find more recyclables in single, isolated trash bins than in trash bins that are paired with recycling bins. The field study involves systematic comparisons of matched locations and focuses on behavioral data that are obtained through audits of trash and recycling bins. / This project is part of the Purdue Recycling Project (PuRe) and the Communication and Cognition Lab.

Social Science/Humanities

Poster Number 141: Joshua Rothenberger

Spatio-Temporal Effects of Climate Change on the diet of North American Hunter-Gatherers

Current research has demonstrated that climate change during the transition from Pleistocene-Holocene epochs, had a significant effect on the diet of Paleolithic peoples of North America. My research involves gathering faunal data from Paleoindian sites in the Great Plains regions in North America, and using statistical models to explain what these data mean in regards to what people were eating and how dietary behavior may have changed given the changes in climate.

Social Science/Humanities

Poster Number 142: Yexin Huang

Teacher Gone Wild: How High School Sexual Harassment Incidents are Constructed in Media from a Claims-making Perspective

Sexual harassment incidents occurred in high school is an ongoing social discussion especially when it involves with the teacher and their students. This article sets out to explore media representations of this incident as well as how news articles portray the involved teachers and students in New York. Adopting from social constructionist perspective, claims-making framework was used to study the forty-seven news articles that were collected. It presents a qualitative study for rhetoric, trends and social change of the sexual harassment incidents committed by teachers to their students from 2011 to 2013 in New York high schools. According to the results, students were portrayed as "innocent victim" in contrast to teachers who seemed to be seen as "perv victimizer". The complaints against city school employees reached a record number in 2012, and the increasing influence of this social problem also helped bringing up discussion of policy change. To cover up the scandals, it was found that several school sent the teachers away to other district instead of firing them directly. This "passing the trash" pattern is similar to the Boston sexual abuse scandal found in Catholic Church. Further work are needed to study broader region of this problem and the similar patterns revealed in other intuitions.

Social Science/Humanities

Poster Number 144: Kathryn Math

The Changing Face of Faith: The Virgin Mary and Christ Child in Byzantine Icons

Icons have a special place in the Catholic and the Orthodox Church. The tradition of icons began with the start of the church itself. Icons served as instructional tools for the vastly illiterate society of the Byzantine Empire. The function of the icon was not only to guide the viewer in religious meditation, but also to convey the prayers of the viewer to the figure depicted. Of all of the icons that have emerged over the centuries in Christian art, the icons of the Byzantine Empire are some of the most intriguing, not only stylistically but in terms of subject matter as well. It was during this period in history that the Virgin Mary, the mother of Jesus Christ, became a prominent symbol in church liturgy and iconography. It was a balancing act. She had to be shown as humble and at the same time blessed. She had to be human and at the same time divine. As the Church shifted focus from the status of Jesus Christ to the care of the individual's soul, the representation of the two changed to reflect the changing ideology. Depictions of the Virgin Mary and Christ child changed, beginning with an emphasis on the familial relationship between the two but shifting to focus on their roles for the viewer.

College of Pharmacy

Social Science/Humanities

Poster Number 145: Victoria Chambers

Generation of a Florescence-Based Cell Culture Assay to Assess Aggregation of Alpha-Synuclein

Parkinson's disease is a neurodegenerative disease where there is a loss of dopamine producing neurons in the region of the brain dealing with motor function. Genetic and pathological evidence has indicated that a key event in the onset of Parkinson's disease is aggregation of the protein alpha-synuclein. A possible treatment for Parkinson's disease is to prevent aggregation of alpha-synuclein. We have identified a novel mechanism which promotes aggregation of alpha-synuclein. This mechanism explains why a toxic genetic variant that leads to an A53T amino acid substitution displays toxicity to dopamine neurons while the V49E variant is non-toxic. We are developing a novel drug screening method using a cell culture approach with a florescence-based determination of alpha-synuclein aggregation. To do this, we created adenoviruses encoding the toxic A53T alpha-synuclein linked to the fluorescent protein EGFP as well as the non-toxic V49E-EGFP as a negative control. Using these adenoviruses, we express

these EGFP-linked alpha-synuclein variants in a neuroblastoma cell line and evaluate aggregation by monitoring inclusion formation. As a validation of this model, we expect to see a significant increase in the number of cells with inclusions for the A53T-treated cells compared to the V49E-treated cells. In the future, the development of this model system will aid in the search for new Parkinson's disease therapies as it will allow us to rapidly evaluate new therapeutic compounds for their ability to reduce alpha-synuclein aggregation.

Life Science

Poster Number 146: Shiqi Tang

Multipronged Approach to Investigate the Mu-Delta Opioid Receptor Heteromer Interface

Our research interest focuses on the investigation of mechanism by which long term us of opioids cause side effect. Opioid receptors belong to a large protein family, G protein-coupled receptors, mainly found on the cell membrane that activate inside signal transduction pathways, and ultimately cellular response. Mu- and Delta- opioid receptors (MOR and DOR) can interact within their receptor family to form heteromeric complexes (MOR-DOR), which display unique functions, relative to homomeric complexes (DOR-DOR or MOR-MOR). Previous studies suggest that interruption of MOR-DOR can lessen the side effects including hyperalgesia. Here, we determined the amino acids which play major roles in forming and maintaining MOR-DOR heteromers. / We used a multipronged approach to investigate the impact of single or double amino acid mutations on the stability and function of the MOR-DOR heteromers. Previous literatures indicated that transmembrane five and six (TM5 and TM6) of DOR are essential for the interaction, and we created nearly thirty mutants spanning this domain based on computational model prediction. We used three assays to test the mutants: a heteromer-selective functional assay, biomolecular fluorescence complementation (BiFC), co-immunoprecipitation (Co-IP). In the heteromer-selective signaling assay, we identified several single mutations in TM5 and TM6 of DOR that inhibited MOR-DOR heteromer function. In the BiFC assay, for which MOR and DOR are fused to complementary fragments of fluorescent protein, we confirmed the importance of these amino acid positions. We will continue to validate these results by creating reciprocal mutations in the MOR. Our ultimate goal is to use the obtained information and optimize a computational model to design compounds that can prevent or disrupt the heteromer formation, which can then be used to probe the physiological role of the MOR-DOR heteromers. /

Life Science

Poster Number 147: Ivanna Zhilinskaya

Staurosporine-Toehold Approach for Development of Protein Substrate Competitive Kinase Inhibitors

Kinases have been shown to be responsible for a variety of disorders and are critically involved in the development and proliferation of cancer. Kinases act by modifying the activity of proteins through phosphorylation using ATP as the phosphate donor. Targeting the ATP binding site with inhibitors has been successful, however inhibition is seldom specific to a single kinase. Selective targeting of ATP binding domains is highly challenging due to the conserved nature of that area among the ~500 protein kinases. In particular, the use of ATP competitive inhibitors has failed to generate isoform selective inhibitors for the PKC family. For this project, I will focus on the development of a selective, protein substrate competitive inhibitor to PKC δ, a validated, synthetic lethal target in cancers. Using DNA-programmed combinatorial chemistry (DPCC), I will build a library of 110,592 (483) unique members. The library is designed to contain potential bisubstrate kinase inhibitors composed of peptidomimetics linked to staurosporine, an ATP competitive inhibitor of many kinases. This library will be assayed for binding to PKC δ. Hits will be identified as molecules with improved affinity over staurosporine. The improved affinity may be due to the binding at the substrate binding domain which will hopefully bind competitively with the protein substrates for the kinase, which may yield greater selectivity. We present progress on library design and chemical derivatization of staurosporine for efficient conjugation to library members.

Life Science

Poster Number 148: Jennifer Hensel

The Effect of Phosphorylation in alpha-Synuclein

Parkinson's disease (PD) is a neurodegenerative disease characterized by the loss of dopaminergic neurons within the substantia nigra of the brain. Surviving neurons contain cytoplasmic inclusions called Lewy bodies. Lewy bodies are rich in the presynaptic protein alpha-synuclein (aSyn). aSyn is a 140 residue protein with four tyrosine residues that can be post-translationally modified by various kinases. The role of aSyn tyrosine phosphorylation in PD is not well understood. Evidence from studies in a Drosophila model suggests that phosphorylation at tyrosine 125 suppresses aSyn aggregation, whereas other findings suggest that nitration of aSyn favors the formation of toxic aSyn oligomers. Post-mortem analysis of brain samples from patients with dementia with Lewy bodies suggests that phosphorylation of tyrosine residues decreases with age. Our aim is to determine the effect of tyrosine

phosphorylation on nitration-mediated aSyn neurotoxicity. / / The goal of this study was to identify tyrosine kinases capable of phosphorylating aSyn on tyrosines 39 and 125. Kinetics assays were used to determine the rate at which select tyrosine kinases phosphorylate aSyn. In addition, we examined the effect of tyrosine phosphorylation on tyrosine nitration and potential crosstalk between neighboring and distant residues. Targeted mass spectrometry analysis was employed for modification site analysis. Successful completion of this work may identify new therapeutic strategies for PD.

Life Science

Poster Number 149: Hyesoo Chae

Vitamin D Regulation of Invasion

As the second leading cause of death among women, breast cancer is expected to create 246,660 new cases in 2016. 99% of breast cancer patients survive before metastasis but the survival rate decreases to 22% as cancer spreads. In order for metastasis to occur, cancer cells must break down physical barriers including the extracellular matrix and basement membrane, which most likely requires matrix metalloproteinases. / Matrix metalloproteinases (MMPs) are zinc-dependent extracellular matrix (ECM) remodeling endopeptidases; they have the ability to degrade most components of the ECM. Present studies show that MMPs are able to modulate the tumor microenvironment and regulate signaling pathways that control cell growth and migration, the immune system, or angiogenesis. In order to assess the mechanistic basis of the 1,25(OH)2D mediated inhibition of metastasis, my project focuses on the role of 1,25(OH)2D in regulating early steps in metastatic migration and invasion of breast cancer cells. / I have shown that treatment of MCF10CA1a metastatic breast cancer cells with 1,25(OH)2D for 48h decreased cell migration, through a wound healing assay. Also in my studies, MMP2 was the only MMP expressed at detectable levels in the MCF10CA1a, metastatic breast cancer cells, suggesting that MMP2 is integral to sustaining MCF10CA1a cell metastatic capability. My data suggests that 1,25(OH)2D (10 nM.) reduces the expression of Matrix Metalloproteinase MMP2 by 32% and 35% at 48 hours and 5 days, respectively. Thus, it can be concluded that 1,25-dihydroxyvitamin D3 may be an effective agent in inhibiting invasion of breast cancer cells through down regulating MMP2 expression. /

College of Science

Life Science

Poster Number 162: Carl Olthoff

Assembly and Testing of FPix Modules for CMS Phase I Upgrade

The CMS experiment is a particle detector used to study proton-proton collisions and is scheduled to undergo a complete upgrade by the end of 2016 called Phase 1. The current state of our detector technology will allow CMS to operate at 13 TeV and allow for greater precision in all measurements so it is of great interest to pursue these upgrades. Purdue University will be assembling and testing the forward pixel modules, the innermost core of the detector, at P3MD Labs. This process begins with the complete visual inspection of the High Density Interconnect circuit (HDI) and the bare sensor module, comprised of a readout-chip wafer (ROC) bump-bonded to 16 silicon sensors. Following inspection, the bare modules are probed to measure leakage current and breakdown voltage. The bare modules are then joined to the HDI using epoxy with a robotic gantry unit and wire-bonded from the HDI to the individual ROCs. Assembled modules are encapsulated around the wire bonds to protect them from the harsh conditions of CMS. Once the encapsulant cures, sensor activity is tested under reverse bias voltage in a cold box to ensure the effectiveness of each sensor. Finally, the modules are thermally cycled from negative 35 degrees Celsius to 50 degrees Celsius to test durability of the module's components. Electrical Grade modules that meet all certifications are shipped to the Large Hadron Collider in Geneva, Switzerland. Here they will measure particle collisions every 25 nanoseconds and search for evidence of undiscovered physics [3]. /

Innovative Technology/Entrepreneurship/Design

Poster Number 178: Rejith Raghavan Manavazhi

Development of Fold and Thrust Belts due to oblique convergence at Burma - India Plate Boundary

We have used sandbox models to simulate convergence along the India – Burma plate boundary, which is characterized by a north-south striking mountain range, the Arakan Yoma, adjacent to the Myanmar Central Basin, and a margin-scale strike-slip fault, the Sagaing Fault, parallel to the range. Despite the available field data and geophysical observations there is a general lack of understanding of how this margin has developed north-south striking thrusts in the presence of roughly northward Indian plate motion. What is clear, however, is that the partitioning of plate motion strain has been important. By calculating the kinematics of analog

models as they develop, and by using digital image correlation, we have been able to evaluate the role of margin shape and boundary conditions on the long-term development of tectonic structures at this margin. Our favored model suggests that the distribution of deformation can be explained by the presence and translation of the Burma “sliver plate” along the Sagaing Fault. The sliver plate’s motion can be resolved into motion parallel to the north-south striking Sagaing Fault and normal to it, over the Indian plate. Image analysis and the calculated deformation fields from the experiment show the progressive accommodation of oblique motion, first as very partitioned deformation and then less so, as the sliver moves northward. We conclude that the distribution and orientation of deformation is a consequence of northward motion of the Burma sliver along the Sagaing Fault and partitioning of strain in the north prior to the docking into Eurasia.

Innovative Technology/Entrepreneurship/Design

Poster Number 181: Muhamad Hafiz Hussin, Yichen Zhong, Lakshya Garg

Evaluation of Functionality and appropriateness of a Cloud-based solution for some Purdue online Map-based Decision-support systems.

The ABE Department has several map-based decision support sytems (L-THIA, Load Duration Curve, Purdue STEPL, etc.) . Computationally these models are based either in-house on ECN servers or elsewhere on campus in the ITAP virtual server cluster. This includes Windows and Linux operating systems, and scripting languages like Python and PhP and JavaScript. Both of those IT situations require ABE provide upgrades, maintenance, and 24/7 oversight. This project will evaluate the appropriateness, ease of use, and functionality of a particular cloud-based solution for some of these online decision support tools. The goal is to move either the models or the non-computational pages to a cloud-based server where maintenance is not responsibility of ABE. This will probably require using a service-based (REST) architecture on the Purdue side of the models, to communicate with the cloud-based portion of the model (perhaps just HTML and JavaScript pages).

Innovative Technology/Entrepreneurship/Design

Poster Number 195: Victor Lee

Investigating Mapping API's with REST Services

This project is evaluated two different API's to create map based webpages. Both cases were trying to use REST services to provide data to a model. One of the things we are investigating is cloud based API is appropriate.The cloud based is a lot less customizable than a local API.

ArcGIS online, Geoserver, Javascript, Python and Curl were used to communicate with each other.

Innovative Technology/Entrepreneurship/Design

Poster Number 235: Eric Theller

Water Erosion Prediction Project with Representational State Transfer

The Water Erosion Prediction Project (WEPP) has existed since the mid-1990s as a powerful software model scientists developed to predict soil erosion using data about land crop management, soils, climate, and topography. The model is run as a separate standalone program which allows various user interfaces to be developed. The objective of the project to modernize WEPP by using Representational State Transfer (REST) services is to make a web API usable by other software that allows for a simple HTTP server request to be made that gathers all of the data needed for WEPP and then runs the model. Projects in 2015 and 2016 have included updates to the REST services and further development of front-end software to demonstrate the web API's usability. These latest improvements include updating the software that the WEPP REST servers use to gather data from SQL databases, organization of code, and developing DHTMLX web page front-end software that makes calls to the WEPP REST API services. The front-end web page was upgraded to include a dynamic and interactive HTML5 canvas which renders a graphic depiction of a hillslope the user can customize and use to run the WEPP model. This hillslope user interface was specifically designed to look and behave in the same way as the desktop version of the Windows interface built for WEPP several years ago. This common interface design is intended to make it as easy as possible for WEPP users to pick up and use the online web interface with any standard web browser.

Innovative Technology/Entrepreneurship/Design

Poster Number 151: Elizabeth Frye

A comparison of flaviviral proteins and the implications of membrane associated viral particles

Dengue virus and Zika virus are part of the Flaviviridae family which are positive sense, single stranded RNA viruses. Also included in the flaviviruses are Yellow Fever, West Nile, Japanese Encephalitis, among others. With the recent Zika virus outbreak as well as Dengue being endemic to many regions worldwide, it is important to study these viruses. However, many steps in viral infection are currently unclear. While general viral progression through the host cell is understood, the specifics of virion trafficking, especially in the secretory pathway, is still not completely understood. Here, alignments of flaviviruses have been done to compare the

various proteins in the viral genome. Electron tomography of Yellow Fever virus was also done and showed that the majority of viral particles were membrane associated as they traverse the secretory pathway. This provides ground work that, in conjunction with an analysis of current literature, can lead to an investigation of how flaviviruses, Dengue in particular, progress through the cell's secretory pathway.

Life Science

Poster Number 152: Elizabeth Fernander

A Tumor Study Tool Kit: Generation of Constructs to Analyze the Effects of SOX9 Ablation in PDAC Cells

Pancreatic ductal adenocarcinoma (PDAC) is one of the leading causes for cancer related deaths in the US. To develop better detection and treatment methods for this disease research is being conducted to gain a deeper understanding of the genetic and cellular changes that occur within the pancreas during PDAC progression. Research has indicated that the transcription factor SOX9 plays a critical role in the development of PDAC. PDAC originates from pancreatic acinar cells, which do not express SOX9 under normal conditions. However, SOX9 expression is clearly detected in both acinar-derived precancerous lesions and in PDAC. Recent studies have shown that acinar cell-specific deletion of Sox9 prevents the development of precancerous lesions, which eventually give rise to PDAC. However, further study is required to better understand the role SOX9 plays during PDAC initiation. To study the importance of SOX9 in late stage PDAC, the CRISPR Cas-9 system was utilized to delete Sox9 from PDAC cells in culture. Six Sox9 knockout cell lines were generated to test the effects of Sox9 deletion on tumor formation by subcutaneous injection in an allograft model. Additionally, to ensure that the phenotype of these cell lines was the direct result of Sox9 deletion, a tet-inducible Sox9 construct was created, allowing for the expression of Sox9 to be rescued in these cell lines by the addition of doxycycline. To test the utility of this system in vivo, a doxycycline inducible luciferase expression construct was introduced into the PDAC cells and used for in vivo imaging. Experiments using these cells indicated that both doxycycline water and food were capable of inducing gene expression in subcutaneous and orthotopically injected PDAC cells in vivo. The constructs generated in this study will be utilized in an allograft model to examine the effect of SOX9 on tumor growth, as well as in other studies to examine the migration and growth-rates of these SOX9 knockout PDAC cells.

Life Science

Poster Number 153: Shreeya Raman

Affect of Diet on BDNF Intensity Levels in Mice

The purpose of the project is to see the affect that different diets have on the intensity of brain-derived neurotrophic factor (BDNF) levels in mouse brains. BDNF has been linked to the regulation food intake and body weight, and therefore this research can give us an idea of how diets might affect obesity and food intake in humans. The different diets included in this project are high-fat/high-sugar diet, fasting diet, and a control diet. Each group of mice were given these diets for different amounts of time, 6 hours, 48 hours, 1 week, and 3 weeks. All mice had no statistically significant difference in body weights and food intake prior to the experimental period. It is expected that a high-fat diet and fasting will decrease the intensity of BDNF levels in the brain compared to the control. The mouse brains were harvested and stained, after which the intensity of BDNF was checked. It was found that there was some difference in the intensity of BDNF in certain parts of the brain, but not in others, and that these differences varied based on time points.

Life Science

Poster Number 154: Baylie Hochstedler

Affects of Predatory Responses on Defense Against Pathogens

Predators in the wild can have many effects on their prey. For example, prey can respond to predation through behavioral or physical changes. How these changes influence the susceptibility of prey to infectious diseases is widely unknown. The goal of this study is to examine the effect of an organism's predatory response on its ability to fend off disease. To examine this, we used Daphnia lumholtzi as a model organism. In the wild, this species commonly induces large helmets and tail spines in response to predators; this morphology is not present in the laboratory where predators are absent., To induce morphological changes in response to predators, we are rearing Daphnia in varying concentrations of "predator cutes" (water taken from fish tanks containing adolescent blue gill). Four treatments of Daphnia were grown in beakers with varying volume and frequency of predator cue exposure, and one treatment was kept in cages inside the blue gill tanks where they were always exposed to the predatory cues. After inducing these changes, the Daphnia will then be exposed to Metschnikowia, a native fungal pathogen. We will then check for virulence and pathogen reproduction to determine how predators influence the host-pathogen relationship. We predict that our results will show that the energy expended by the daphnia to produce their predatory response will cause them to be more susceptible to the disease.

Life Science

Poster Number 156: Emily Traxler

Agrobacterium's Role in Gene Expression and Infection

Agrobacterium transfers a piece of bacterial DNA, the T- DNA, to plant cells where it makes its way through the cytoplasm to the nucleus. Once in the nucleus, T-DNA integrates into the host genome and expresses genes. Under normal circumstances, these genes cause the disease Crown Gall on plants. However, scientists have learned to manipulate T-DNA, replacing disease genes with genes of benefit to the plant. Many genetically engineered crop plants with desirable traits (disease resistance, herbicide tolerance, and enhanced nutritional value) were generated using Agrobacterium . Unfortunately, many important crop plants, including those important to Indiana farmers (corn, soybeans, and wheat) remain highly recalcitrant to Agrobacterium -mediated genetic transformation. / / Our research focuses on understanding the role of plant genes and proteins in this natural genetic engineering process. We have identified plant genes involved in bacterial attachment to plant cells, T-DNA and Virulence transfer to and cytoplasmic trafficking within plants, T-DNA nuclear targeting, and T-DNA integration. Recently, we have been able to manipulate some of these genes to improve Agrobacterium transformation efficiency. We are currently working with agricultural biotechnology companies to improve the genetic engineering of crops, including those important for Indiana's economy.

Life Science

Poster Number 157: Shovik Bandyopadhyay

Analysis and Identification of Unique Primitive Cellular Subpopulations in Secondary Acute Myeloid Leukemia Using Mass Cytometry

Mass cytometry has developed as a powerful tool to analyze cellular networks on a single-cell level. However, mass cytometry data is notoriously challenging to analyze, generating massive data sets due to the ability of mass cytometry to measure >40 channels per experiment. Using traditional biaxial gating, this would lead to >780 plots required to display each combination. / To mitigate the problem of analyzing such massive data, various groups have created specialized software using a variety of platforms to analyze this high dimensional data in unique ways. These tools have a range of applications: from using phenotypic similarities to cluster cells, stratifying unique signaling subpopulations using stimulation response, mapping the developmental trajectory of neoplastic cells, among many others. In this study, we compare and contrast the benefits and drawbacks of some of these techniques including SPADE, viSNE, Citrus, SARA, and PhenoGraph. / Furthermore, we discuss how each of these techniques can be

used to gain insight into different biological questions. Using these techniques we demonstrate how some of these tools can be used to draw distinct conclusions about the role of signaling pathways including JAK-STAT and NFκB in eight patients with acute myeloid leukemia secondary to a diagnosis of myeloproliferative neoplasm (sAML). / Our study indicates that multiple analysis tools should be used to draw the most meaningful conclusions from the data. In this case, biaxials, viSNE, and SPADE were all relatively unhelpful in interrogating NFκB or JAK/STAT in sAML. However, Citrus offered a different approach that revealed multiple "functionally primitive" cellular subpopulations that are likely relevant to sAML pathogenesis. Our findings suggest that restricting cytometric analysis to lineage− CD34+ CD38− cells in environments of dysregulated hematopoiesis, as in leukemia, may exclude populations of cells that could be relevant to leukemic development and progression.

Life Science

Poster Number 158: Kenny Nguyen

Analysis of Mitochondrial Turnover in Neuromuscular Junctions of Parkin Mutants

The accumulation of dysfunctional or damaged mitochondria in neurons has been linked to the pathogenesis of many neurodegenerative diseases, including Parkinson's disease. It has been proposed that the Parkinson's-related proteins PINK1 and Parkin regulate mitochondrial quality control by selectively targeting depolarized mitochondria for autophagic degradation, a process known as mitophagy. The compartmentalization of mitochondrial turnover in neurons still remains unclear, but evidence suggests that mitochondria are locally degraded in the distal axon and perhaps in the the neuromuscular junctions (NMJs). To study this, intact Drosophila nervous systems were analyzed in vivo by performing gentle dissections on third instar larvae to expose the ventral ganglia and segmental nerves with their NMJs. Both control larvae and parkin mutants were genetically modified to mark mitochondria via mito-GFP expression in their motor neurons, with parkin mutants being additionally modified by deletion of the parkin gene. The physiological states of mitochondria were quantified through measurements of mitochondrial membrane potential (Δψ_m), and the density of mitochondria in NMJs were analyzed through comparing αHRP and mitoGFP stain intensities in synaptic boutons. Unexpectedly, mitochondria of parkin mutants displayed normal Δψ_m readings in NMJs, indicating that mutant nerve terminals do not accumulate senescent mitochondria. In addition, reduced mitochondrial density was observed in synaptic boutons of parkin mutants. These results support the hypothesis that mitochondria do not undergo parkin-dependent turnover in the NMJs. By elucidating the role of Parkin in the synapse of neurons, the pathogenic mechanism of Parkinson's and other neurodegenerative diseases will be better understood.

Life Science

Poster Number 159: Bridget Perkins

Analysis of the Transcriptional Regulation of the mgtB Magnesium Transport Gene of Salmonella enterica

This experiment aims to analyze the transcriptional regulation of the mgtB magnesium transport gene of Salmonella enterica. In this experiment we will study the effects on translation when limiting proline concentrations on Salmonella enterica which are mutated in the production of proline. Salmonella enterica has three known proline transport systems: PutP, ProP, and ProU. A total of 5 mutations will be made to examine transcriptional effects, ultimately making a strand with a deletion of ProBA with PutP, ProP, and ProU mutations and a mgtB-lacZ fusion. A series of beta galactosidase assays will be performed to characterize the promoter activity under the various conditions when compared to the wild type strand of Salmonella enterica. Beta galactosidase assays will be performed on strands containing different levels of proline as well as with low and high magnesium levels to determine induction ratios.

Life Science

Poster Number 160: Jade Keane

Analyzing the Social Complexity Hypothesis by looking at Vocal Complexity of Mixed Species Flocks

The social complexity hypothesis states that individuals involved in complex flocks with diverse relationships will produce a greater diversity of vocal signals than individuals in smaller, less complex flocks. We tested this in Carolina chickadees and the eastern tufted titmice. Both species form complex flocks in sizes from two to eight birds. Both species also form mixed species flocks that contain the downy woodpecker and white-breasted nuthatch. We studied these flocks at three different forest locations in West Lafayette. The different species' calls were recorded in the field at various hours of the day, and individual behavior was also recorded. Data from the winter through the summer showed that vocal repertoire was simpler in the summer when there is no flocking behavior, compared to the winter when flock size is maximal. These data show us that the differences in flock complexity relates to a change in the complexity of the vocal repertoire across seasons.

Poster Number 161: Nathan Chou

Are Micro-Plastics on the Menu? (Micro-Plastics Effects on Larval Fish)

Recently, micro-plastics, plastics less than 500 µm in diameter, have been increasingly documented in marine and freshwater ecosystems including the Great Lakes. Because of the prevalence of this pollutant, regulations have been imposed through state and federal action to discourage and ban micro-plastic beads in consumer products. Experiments have shown that adult fish and zooplankton will occasionally consume micro-plastics. However, it is unclear if micro-plastics affect larval fish, a critical life-stage for most fish populations. Larval fish are a key part of the ecosystem and are highly sensitive to changes in their environment and food availability. It is therefore informative to determine if micro-plastics pose a direct threat to larval fish which could mistake micro-plastics for a food item. Micro-plastics could have direct and indirect effects on larvae by blocking gut passage or lowering feeding efficiency. Two experiments were conducted to assess micro-plastics effects on, 7 and 14-day old larval fathead minnows, Pimephales promelas. Larvae were exposed to natural prey, Artemia Nauplii and eggs, and two sizes of plastic micro-beads (425µm and 180 µm). Five larvae were placed in to one of four treatments with increasing ratios of prey to plastics (1:0 ratio (control), 1:0.2 ratio, 1:0.4 ratio, and 1:2 ratio) and were allowed to feed for 3 hours. Each treatment was replicated 15 times and gut contents of larvae were examined afterwards. Larvae consumed napulii and eggs, but only one larvae was documented to consume a single micro-bead. This suggests that micro-plastics were not directly or incidentally consumed by larvae. Plastics may still have indirect effects on feeding efficiency which will be evaluated through subsequent experiments.

Life Science

Poster Number 163: Ashlynn Kokaska

Assessing the role of Fic proteins in E.coli

Fic proteins are evolutionarily conserved from bacteria to humans, and are characterized by an Fic amino acid motif of HxFx[D/E/N][G/A]N[G/K]RxxR. Several bacterial Fic proteins act as virulence factors or toxins that post-translationally modify host proteins leading to cell death, a mechanism pathogenic bacteria exploit to evade immune defenses. Fic proteins are inter- or intra-molecularly regulated by an inhibitory helix defined by a (S/T)XXXE(G/N) motif. and can be classified into three toxin/anti-toxin groups with the Therefore, Fic proteins have been classified as toxin/anti-toxin modules. Fic proteins were originally identified in Escherichia coli, where a mutation in the gene encoding the E. coli Fic protein (EcFic) resulted in aberrant cell division. Consequently, E. coli developed a filamentation phenotype in response to heat shock and cAMP, thus coining the name Fic (filamentation induced by cAMP). Despite the advances in understanding Fic proteins from pathogenic bacteria, there is a lack of a basic understanding

pertaining to the role of Fic proteins during the life cycle of non-pathogenic bacteria such as E. coli. Our goal is to understand the role of EcFic in regulating cell division in E. coli and why its aberrant function causes filamentation. To this end, we aim to study the E. coli toxin/anti-toxin complex comprised of EcFic and its putative inhibitor, YhfG. By co-expressing affinity tagged versions of EcFic and YhfG, we aim to identify protein targets that the EcFic-YhfG complex interacts with. These protein targets will be identified by mass spectrometry, and then be validated and assessed for Fic-mediated modifications. having the characteristic motif of (S/T) XXXE (G/N) within the Fic protein or as a separate protein. Escherichia coli is a simple bacterium containing anti-toxin/toxin protein complexes. One understudied complex is the Fic/YhfG complex where Fic and YhfG are the predicted toxin/antitoxin complex, respectively.

Life Science

Poster Number 164: Jake Lindsey, Megan Parker, Melissa Junk

Bacteriophage Genome Annotation

Bacteriophages have been rising in popularity as a research topic. They provide possible new proteins and mechanisms for bacteria prevention and treatment. Bacteriophages provide a new insight into protein expression and possible new medicinal treatments as an alternative to traditional antibiotics. There is a lot unknown about bacteriophages so that is why this annotation was necessary. The annotation was performed in order to explore the genome of the bacteriophage Hughesyang and to evaluate probable proteins expressed by the genome.This helped an overall understanding be established with functionality as well. The annotation was performed using various software such as DNA Master, Phamerator, and Starterator. These were fundamental in the analysis of the phage genome. Various changes were made to the genome, such as changing start codon positions, in order to provide a more accurate, plausible, and reliable genome overall. Many genes were found to have had a higher chance of occurrence once the start codon has been changed, and it was decided that some genes called in the DNA Master program should be deleted to provide a higher quality genome.

Life Science

Poster Number 165: Cody Thorson

Bridging the Gap Between Cell Growth and Leaf Development

Bridging The Gap Between Cell Growth and Leaf Development / Cody L. Thorson, Samuel A. Belteton, Tzu-Ching Wu, Jessica Lunsford, David Umulis, and Daniel B. Szymanski / / A major crop focus is increasing photosynthetic efficiency as a way to improve crop yield. Light capture efficiency is dependent on the structure and orientation of the leaf. The epidermis is an

important leaf tissue that can influence the growth properties of the leaf. In dicots the epidermis is primarily composed of interdigitated and highly lobed cells termed pavement cells. One limitation in the field is the lack of information about how the growth of individual cells can scale up to affect the growth properties of the leaf. One focus of my work is to use a novel computer program termed LobeFinder to quantify cell growth and how it correlates to organ structure. Another focus is to better understand how the actin cytoskeleton influences pavement cell development. The Actin related protein (ARP)2/3 complex is somehow involved. Arp2/3 nucleates new 'daughter' actin filaments from the side of existing 'mother' actin filaments. The null mutant, dis2, encodes the ARPC2 subunit and completely inactivates the ARP2/3 complex. This poster will mainly focus on describing efforts to determine if Arp2/3 affects the initiation or maintenance of pavement cell lobes. /

Life Science

Poster Number 166: Christy Reick

Building a new proteomics method for global protein complex discovery in plants

Individual proteins often oligomerize into heteromeric complexes, and a systems-level knowledge about the composition and dynamics of complexes is needed to understand how developmental, metabolic, or mechanical processes are regulated in a cell. Our quantitative mass spectrometry-based technique uses size exclusion or ion exchange chromatography to separate mixtures of protein complexes. Under these conditions, proteins that form a stable complex should coelute. Each chromatography fraction collected is analyzed via quantitative mass spectrometry (MS). A clustering analysis of the results groups thousand of proteins with similar elution profiles. A validation method is needed to determine the number of clusters chosen and the accuracy of the clustering result. However, there are a limited number of experimentally validated complexes in Arabidopsis. Therefore, I created a database of protein complexes for Arabidopsis proteins using homologs to known metazoan complexes. Homologs of metazoan proteins were identified using metaPhOrs software, a phylogeny-based predictor, and InParanoid software, a sequence based predictor. Corum, a known metazoan protein complex database, was used to assign the homologs to a complex. Complexes were filtered to contain at least two unique subunits. This criterion identified 49 complexes in the MS data. These complexes include ribosomal subunits, elongation factors, synthetase complexes, and the proteasome. Several of the profiles show similar elution and can be predicted to be in a complex, however other profiles show two or more of the subunits eluting as a subcomplex. Some profiles are dissimilar, which could be caused weak binding interactions and dissociation during chromatography separations. Analyzing known complexes in this profiling technology is essential to validate the performance of the chromatography and clustering analysis and therefore enable us to learn how the cell functions as a system of protein complexes.

Life Science

Poster Number 167: Alyssa Fanara, Elisabeth DeMarco

Characterization of mitochondria in the inferior colliculus of young and aged rats

Aging, a ubiquitous process that leads to the degeneration of many neurological functions, compromises the auditory system by an unclear mechanism. Current research suggests changes in mitochondrial characteristics, including size and functional capacity, correlate with aging and neurodegenerative disorders. Cytochrome C Oxidase (COX) is critical to ATP synthesis, which is known to be affected by neurodegeneration. In a continuing analysis, we are characterizing changes in the inferior colliculus (IC) in young and aged rats with respect to mitochondrial size, density, and levels of COX to test the hypothesis that mitochondrial changes affect neurodegeneration. We predict a decrease in hearing ability will correlate with a decrease in mitochondrial size, an increase in density, and decrease in COX levels throughout both dorsal and ventral IC. Hearing ability was tested using clicks at varied loudness, measured in decibels, for aged and young rat models. After recording hearing thresholds and euthanasia, antibodies against COX were used both to identify the presence of mitochondria in the neurons and to indicate protein levels. Confocal digital images of COX-stained ventral and dorsal IC tissue sections were analyzed using ImageJ software to characterize these differences between models. Preliminary data suggests differences in mitochondrial size, density, and COX levels across hearing abilities; further analysis is needed to determine whether these differences are statistically significant. We are conducting additional investigations to determine if age or hearing ability is more strongly correlated to the observed changes in mitochondrial characteristics.

Life Science

Poster Number 168: Hayley Drozd

Characterization of Projections onto V1 in VGlut2-ChR2 Mice

In the retrogeniculate visual pathway, visual input passes through the lateral geniculate nucleus (LGN) of the thalamus before projecting onto the primary visual area (V1). Anterograde tracing studies have shown additional areas of the brain that project onto V1 in a layer-specific manner. In order to characterize projections onto V1 in a vesicular glutamate transporter 2-channelrhodopsin (VGlut2-ChR2) mouse line, Fast blue, a retrograde tracing fluorescent dye, was injected into V1 in a layer-specific manner. As the reverse of anterograde tracers, the dye is picked up by the axon terminals, travels through the axon in reverse direction from the action potential, and is expressed in the cell bodies of the neurons that project onto the injection site. By visualizing projections onto V1 in the VGlut2-ChR2 mouse line, one can also determine co-

localization of VGlut2-ChR2 expression and of Fast blue dye retrograde traces from each layer of V1. Because this mutant is significant to on-going projects at Purdue, identifying co-localization of VGlut2-ChR2 expression with the Fast blue-labeled areas contributes to a better characterization of V1 in the VGlut2-ChR2 mouse line.

Life Science

Poster Number 169: Stephenie Droll

Characterizing Xylanase Knockout Mutants of Mycosphaerella graminicola

Mycosphaerella graminicola, also known as septoria tritici, is an important fungal pathogen of wheat. Previous studies have indicated that Mycosphaerella graminicola produces xylanase to degrade wheat cell walls and obtain nutrients. The Goodwin lab previously produced septoria xylanase mutants. The purpose of this study is to characterize these mutants. First, activity of xylanase in the mutant and wild type isolates was assayed visually, using xylan-containing agar plates and filtrate from cell cultures. Next, susceptible wheat cultivars were innoculated with the mutant and wild type isolates, and disease severity was rated to determine whether or not xylanase knock out reduces septoria pathogenicity. Finally, qPCR was run on RNA extracted form the septoria isolates to confirm the knockout status of the xylanase enzymes.

Life Science

Poster Number 170: April Przyborski

Competition of the fittest: Interspecific competition in parasites within intermediate hosts

Organisms often compete for resources to increase their survival and fitness. Parasites that co-infect the same host compete for finite host resources. Competition between parasites of different species has been widely documented, but little is known about how dynamic these interactions are over space and time. In this context, interspecific competition is examined between parasites seeking out intermediate hosts. Few studies have examined the effects of this competition between parasites and how it can vary over a multitude of time points. The goal of this study is to examine interspecific competition between trematode parasites in their snail intermediate hosts throughout an infection season to determine patterns of co-existence and competitive exclusion between parasite species. Helisoma trivolvis and Physa spp. snails were collected from two wetlands in the Purdue University Wildlife Area throughout the summer. Each snail was measured in length and screened to determine infection status. Parasites were identified using taxanomic guides and genetic sequencing using a nuclear and mitochondrial marker. Results of the identified parasites and patterns of interspecific competition within hosts and across host populations will be discussed. /

Life Science

Poster Number 171: Jeffrey Morrison

Construction of a M13-lux filamentous phage for the rapid screening of pathogenic E. coli for a functional F pilus.

The veterinary, agricultural, and healthcare sectors all have a vested interest in microbial pathogens and their potential transfer of genes associated with virulence. To explore this prospect, a bioluminescent M13 bacteriophage, which specifically infects F' bacteria, was created to screen Escherichia coli strains. The luxCDABE cassette was first inserted into the M13 replicative form (RF), and a plaque assay was performed using F' E. coli K12 ER2738 to confirm light production. An assay was done using the M13-lux phage to infect E. coli K12 ER2738 to determine the amount of light production at various concentrations of both phage and bacteria, finding that higher cell concentrations reach peak light production faster, and that the relationship between phage and bacterial concentrations is not as linear as expected. This could be due to the depletion of nutrients in the medium and the limited growth of cells allowed by the infection of the phage. Low concentration of phage allowed cell growth, and after 10 h high levels of luminescence were observed. In addition, the phage was used to screen over 300 strains of pathogenic E. coli for the F' phenotype, due to its role in lateral gene transfer of virulence factors. Few of the tested strains (<15) were found to produce significant amounts of light indicating a positive result. Although the recombinant M13-lux showed promise a screening tool for the F' phenotype it also provided information on the relationships between infection and cell growth.

Life Science

Poster Number 174: James Held

Determining specific, high affinity binding motifs between histone linker H1 protein and DNA

The family of histone proteins' primary function is to aid in the condensation of chromatin. Core histone proteins assemble to form a nucleosome; a protein complex that DNA can wrap around. Unlike the aforementioned core proteins, histone linker protein H1 sits on top of the nucleosome-DNA complex and serves to keep the DNA and nucleosome "linked." Histone protein H1 has been found to play an essential role in maintaining higher-order chromatin structure and regulation of gene expression. H1 protein directly interacts with DNA by binding to the surface of DNA near nucleosomes and functions to condense chromatin, thereby acting as a transcriptional repressor of genes in that region. Previous studies show that histone H1 protein may preferentially bind to AT rich regions of DNA, however; precise sequence patterns have not been defined. We will analyze the binding specificity and affinity of H1 to DNA by

utilized a modified PCR Selex procedure for a synthetic oligonucleotide (N45) and a protein binding filter assay to sequentially select for DNA sequences that have the highest affinity for histone H1 protein. After isolating an oligonucleotide sequence that shows high affinity for H1, the sample will be submitted for high throughput sequencing. The sequence will then be analyzed for motifs and other qualities that would explain why the specific sequence preferentially exhibited higher affinity for the histone H1 protein.

Life Science

Poster Number 175: Rebecca Steele

Determining the consequences of simultaneous Mist1 deletion and KrasG12D activation upon pancreatitis induction

The overarching goal of this project is to elucidate the role of acute pancreatitis (AP) in pancreatic cancer progression. AP, a known risk factor of pancreatic cancer, is an exocrine-specific pancreatic disease caused by premature activation of digestive enzymes leading to inflammation, fibrosis and tissue disruption. During pancreatitis, acinar cells undergo acinar-ductal metaplasia (ADM), a feature that is also found in pancreatic intraepithelial neoplasia (PanIN) and pancreatic ductal adenocarcinoma (PDAC) cases. Our lab studies an exocrine-specific transcription factor, MIST1, which is expressed in adult acinar cells and plays a prominent role in maintaining acinar cell organization. Previous studies performed with Mist1 knock-out mice have shown that lack of MIST1 disrupts pancreatic acinar cell organization and polarity. Because of this, embryonic Mist1KO mice are predisposed to develop pancreatic disease, which can be problematic for our studies. To overcome this sensitivity, a conditional Mist1 knock-out mouse model is desirable. We made a conditional knockout (Mist1cKO) mouse and crossed it with LSL-KrasG12D mice to generate Mist1cKO; LSL-Kras mice. In an effort to determine the role of pancreatitis in pancreatic cancer development, we studied Mist1Het; LSL-Kras and Mist1cKO; LSL-Kras mice. Preliminary studies reveal that upon simultaneous Mist1 deletion and Kras activation, alongside the induction of pancreatitis, PanIN formation decreased compared to Mist1Het; Kras animals.

Life Science

Poster Number 176: Chirag Patel, Xiaofei Zhang, Benjamin Chun

Developing Pupillometry for Behavioral Assesment of the Mouse Model Fragile X

Individuals with autism spectrum disorders (ASDs) including Fragile X Syndrome (FXS) commonly display social, perceptual, and behavioral abnormalities. Fragile X syndrome (FXS) is the most common genetic cause of autism. Perceptual deficits and aberrant neural activity in

the visual pathway of FXS remain poorly understood. We have developed a camera based pupil tracking software using OpenCV (an open-source computer vision library) capable of measuring visually evoked changes in pupil area and position in the FXS mouse model (Fmr1 KO). Changes in pupil area and positioning are believed to correlate with changes in arousal or visual processing and may serve as an indirect readout of brain state. To determine visually evoked changes in pupil area and position, head-restrained wild type or Fragile X mice viewed 60 presentations of drifting gratings once per day for 5 days. Both wild type and Fragile X mice displayed decreases in pupil size during visual stimulation compared to control grey screen, suggesting perception of the visual stimulus. However, the average pupil area of Fragile X mice remained significantly higher after 5 days of training compared to wild type mice. Our results are indicative of a hypersensitivity to visual stimuli in FXS that persists despite extensive habituation to the stimuli.

Life Science

Poster Number 179: YI YI GAN

Directed Differentiation of Adipose Stem Cells towards Brown Fat

Obesity epidemic has become one of the country's most serious health issue. Brown fat or Brown Adipose Tissue (BAT) is a metabolically active fat for heat production (thermogenesis). The abundance of brown fat in obese subject is relatively scarce as compared to normal weight people. Previously, our lab has demonstrated that inhibition of Notch signaling transduction could increase the abundance of brown fat through browning of white adipose tissue (Bi et al, 2014, Nature Medicine). In order to accomplish our goal of reducing white fat and increasing brown fat in obese individuals, we are designing a nanotechnology-based tool that could effectively block Notch signaling transduction in adipose tissue with the collaboration with Dr Meng Deng from Department of Agricultural and Biological Engineering. We will evaluate the efficacy of the polymer-based system to induce browning of white adipose tissue and study how it will help to lower the obesity rate. In addition, we will use microscopic imaging techniques to study Notch signaling in the adipose stem cells. Lastly, we measure the metabolic activity by using Extracellular Flux Analyzer.

Life Science

Poster Number 180: Clara Suh

Effect of ACAT-1 inhibiting drug Avasimibe on Prostate Cancer

Prostate cancer is the second most common type of cancer in men and continues to affect more than one million individuals every year. Previous research has shown that the

aggressiveness and progression of prostate cancer is linked with the active cholesterol metabolism within the prostate cancer cell. ACAT-1 is a key enzyme that converts free cholesterol into cholesterol estification during metabolism, and studies have shown that inhibition of ACAT-1 may correlate with decreased aggression of prostate cancer. In my research, I am investigating the effect of the ACAT-1 inhibiting drug Avasimibe on prostate cancer to analyze if a currently safety-proven drug for treating cardiovascular issues can be also used to treat prostate cancer.

Life Science

Poster Number 182: Hannah Horton

Examining the role of Mettl21c in myoblast differentiation

Age-related sarcopenia is a quickly-progressing condition that affects over one-third of adults over the age of 60 in the United States. Since there is no current treatment to completely reverse the muscle-degenerating effects of sarcopenia, there is a high level of interest in identifying genes that can be expressed to increase muscle mass and function. A genome-wide association study (GWAS), suggests that the gene Mettl21c may be related to myogenesis, and the knockdown of Mettl21c inhibits myogenesis. The purpose of this project is to better understand the role that Mettl21c expression plays in myoblast differentiation. In order to accomplish this, Mettl21c overexpression will be induced in C2C12 myoblasts and satellite cell-derived myoblasts through adenovirus transduction. These myoblasts will be induced to differentiate for 1-3 days. Then, an immunostaining assay will be used to observe changes in myotube morphology and to calculate the differentiation index and fusion index. Post-differentiation, mRNA and proteins will be extracted from myotubes in order to investigate the molecular mechanisms behind myogenesis. Through these methods, we hope to observe an improvement in both the structure and function of myotubes differentiated under the influence of an overexpressed amount of the Mettl21c protein. / /

Life Science

Poster Number 183: William Mbongo

Examining the Role of PH domain in the Catalytic Core of PLCε

Due to their critical role in regulating cardiovascular function, phospholipase C (PLC) enzymes are of great pharmacological interest. PLC enzymes are a highly conserved class of proteins that hydrolyze the lipid phosphatidylinositol-,4,5-bisphosphate (PIP2) to produce the second messengers inositol-1,4,5-triphosphate (IP3) and diacylglycerol (DAG). These molecules increase intracellular calcium concentrations and protein kinase C. PLC enzymes are activated

downstream of G protein coupled receptors and receptor tyrosine kinases through direct interactions with heterotrimeric and small G proteins. The PLCε subfamily is of particular interest, as it is required for sustained PIP2 hydrolysis and is activated by the Rho, Ras, and Rap G proteins. However, the molecular basis of PLCε regulation under basal and activating conditions is unknown. An essential first step in PLCε activity is translocation to the cell membrane, which could be modulated by the PH domain near the N-terminus of the protein. To begin characterizing this domain, we sought to express and purify the isolated PH domain from PLCε for biochemical and structural studies.

Life Science

Poster Number 185: Sunny Lee

Exploring the Mechanism of Cdk5 Deregulation in Alzheimer's disease

Cdk5 activity is highly deregulated in many neurodegenerative diseases including Alzheimer's disease. Cdk5 deregulation in Alzheimer's disease contributes to all three hallmarks of the disease – formation of neurotoxic beta-amyloid, neurofibrillary tangles and extensive neurodegeneration. However, the mechanism of this deregulation remains unclear. Cdk5 is activated by binding its partner p35 and its truncated form, p25. We have recently identified a few residues in p35 and p25 using data mining which are mutated in Alzheimer's patients. These findings led us to hypothesize that some of these mutations in p35 and p25 may hyperactivate Cdk5 leading to neurodegeneration in Alzheimer's disease. The goal of this project is to generate these mutants of p35 and p25 and determine their potential to activate Cdk5 in vitro and in cells compared to wild-type p35 and p25.

Life Science

Poster Number 186: Alexus Roberts

Feeding Mechanics and Functional Morphology in the Jaws of Sculpins

Species with overlapping geographic ranges, similar morphology, and ecological roles often vie for the same resources and therefore face competitive exclusion. This competition can be reduced if species vary in skeletal and muscular anatomy, changing biomechanical performance. We examined biomechanical variation of feeding structures in a group of nineteen sculpins (Cottoidea) that co-occur in the marine habitat around the San Juan Islands. We quantified evolutionary correlation of skeletal morphology and muscle morphology by conducting phylogenetic independent contrasts using a phylogeny constructed from published molecular data. We hypothesized that skeletal leverage (mechanical advantage) and muscle architecture (gearing) could either display a positive evolutionary correlation (changing over

evolutionary time to perform inversely of each other), or the features could display a negative correlation (changing over evolutionary time to perform in the same way). We found a positive correlation between evolutionary shifts of out-lever length and adductor muscle length, but no correlation between evolutionary shifts of in-lever length and adductor muscle length or adductor muscle length and lever ratio. Our results demonstrate that skeletal leverage and muscle architecture evolve independently in individual species of sculpins. These results also suggest that these two functional units (skeletal morphology and muscle morphology) both contribute to biomechanical diversity in closely related, geographically co-occurring sculpin species, indicating their importance as metrics of ecomorphological diversity.

Life Science

Poster Number 187: Katherine Terhune, Peter Sandler, Raphael Bednarsky , Daniela Kocher

Figures with cell images: Guidelines for communicating data from cell microscopy images to enhance data reproducibility

Cell imaging is a key tool for scientists researching a biological model, and when cell images are published, researchers have a limited space in their figure to adequately describe their images. The ability to succinctly and adequately describe a cell image is needed by any competent scientist who communicates data from experiments that involve microscopy. To help undergraduate research trainees develop the skills of a competent life scientist, we analyzed figures containing cell images in three scientific journals. We examined cell images and their figure legends to document how information is commonly communicated with symbols, labels, and the presentation of images. Cell images are generally presented with information about the experimental subject (cell type and source), research tools (type of microscopy and what is expressed or stained), experimental design (treatments, controls, and outcome variables), and interpretation (meaning of organization and regions of interest). Any information that appeared in 30% of the figures with cells in scientific research publications was compiled into a chart that will be useful to undergraduate research trainees as reference material. These guidelines were applied to evaluate figures with cell images published by undergraduate students in four undergraduate research journals. Here we show that symbols were lacking, figure organization was poor, and key information like cell type and experimental treatment was missing in many figures published by undergraduate students. We anticipate our findings to be a starting point for developing agreed-upon guidelines to enhance data reproducibility and to stimulate conversation between research trainees and their mentors. Thanks go to the University of Applied Sciences, Fachbereich Biotechnologie and the 2015 Fulbright Scholar - University of Applied Sciences, FH Campus Wien Visiting Professorship in Vienna, Austria, Europe

Life Science

Poster Number 188: Umi Scales

Fluorescent Biosensors to Measure Ionic Strength in Cellular Environments

Ion balance is vital to all normal cellular function and can be altered by physiological changes in the cell or pathologically in response to injury or edema. We will develop fluorescent biosensors to measure the fluctuations in ionic changes in live cells. The biosensors that we will be utilizing, FLIPW-CTYT and its non-dimer variant, FLIPW-CTYT (A206K), contain a fluorescent protein pair that undergoes changes in the Förster Resonance Energy Transfer (FRET) in response to increasing ionic concentrations. By characterizing the biosensors' changes in FRET in response to varying concentrations of different salts and crowding agents in solution studies, we may be able to quantify ionic strength and detect stress in models of brain injury or other neurological conditions.

Life Science

Poster Number 189: Saki Mihori

Förster Resonance Energy Transfer of Cerulean and Venus Fluorescent Proteins In Live Drosophila melanogaster Eyes

Förster resonance energy transfer (FRET) is a physical phenomenon that is used in biology to measure the proximity of two protein molecules and their interactions with one another. The two molecules consist of a donor (Cerulean Fluorescent Protein (CFP)) and an acceptor (Venus Fluorescent Protein). Both are variations of Green Fluorescent Protein (GFP) and emit light of a different spectrum. When CFP and Venus are within a few nanometers of each other, the excitation of CFP can cause Venus to fluoresce. The purpose of this study was to determine if the values of well-established FRET standards published by Vogel, would apply in a living model system, the eyes of a live Drosophila melanogaster. Using transgenic flies made by Kirk Mecklenburg (IUSB), the Vogel standards CFP and Venus separated by 5, 17, and 32 amino acids in fly eyes were expressed, and FRET was measured using MetaMorph and RiFRET software. / This study found that flies with CFP and Venus 5 amino acids apart (Cerulean-5-Venus) had the highest percent efficiency and Cerulean-32-Venus had the lowest percent efficiency. Cerulean-17-Venus had an intermediate percent efficiency. The values obtained in this study for Cerulean-5-Venus, Cerulean-17-Venus and Cerulean-32-Venus were 44.5%, 37.3% and 29.9% respectively. They agree well with published standard values of 43%, 38% and 31% respectively. This concludes that FRET can be used effectively to study protein-protein interactions in living Drosophila eyes. /

Life Science

Poster Number 191: Helena Lysandrou

Harnessing Notch Signaling for Biomaterial Scaffold-based Bone Regeneration

Bone fracture has recently become prevalent, especially with an increasingly aging population. Current bone grafts procedures, including autografts and allografts, are hindered by multiple factors, such as limited supplies and inconsistent bone healing. Scaffold-based bone tissue engineering emerges as a prospective strategy to aid in bone regeneration through delivery of growth factors such as bone morphogenic proteins (BMPs). However, the use of BMPs suffers from several drawbacks such as protein instability and immunogenicity. Therefore, there exists a great need for the development of novel therapies to promote bone healing. Notch signaling, a pathway critical for cell-fate determination has been shown to regulate osteogenesis, which suggests the potential of targeting Notch to enhance bone repair. The long-term goal of this work is to develop biomaterial-based regenerative technologies to induce bone regeneration by fine-tuning Notch signaling. In this study, a three-dimensional (3D) porous scaffold system was fabricated from biodegradable poly(lactide-co-glycolide) (PLGA) to mimic structural and mechanical properties of native bone using a microsphere sintering technology. In vitro studies were conducted to evaluate the effects of notch inhibition via a γ-secretase inhibitor DAPT on osteoblast responses. When the DAPT was added during the 2D culture on tissue culture polystyrene (TCPS), the osteoblast mineral deposition was significantly enhanced. Intriguingly, the enhancement was more pronounced on the 3D PLGA scaffolds, which may be attributed to the increased cell-cell contact in the 3D culture environment. Current efforts are focused on scaffold-based modulation of Notch signaling with both quantitative and temporal precision for enhanced osteogenesis.

Life Science

Poster Number 192: Andrew Eller, Kye Stachowski

Identifying the Sex-Determining Pheromone in a Fern

The fern Ceratopteris has a sex determination mechanism that is dependent on the presence of a pheromone called Antheridiogen of Ceratopteris (ACE). In the absence of the pheromone, the individual develops as a hermaphrodite. The hermaphrodite produces and secretes ACE into the medium, causing its neighbors to be male. The objective of this experiment is to characterize the structure of ACE, which is currently unknown. In order to produce enough ACE for analysis, mutant hermaphrodite-only individuals were grown in 60L of media containing vitamins and salt. After incubating for ten days, which was determined to be an optimal incubation period, the hermaphrodites were removed by filtration. To purify ACE, XAD-16N resin was added to the

media conditioned by the growth of hermaphrodites, and then eluted from the resin with ethyl acetate to yield a crude extract. HPLC was used to fractionate the crude extract; each fraction was bioassayed for ACE activity. 50 fractions were collected using a 5-75% Acetonitrile/MeOH + .05% TFA solvent system. Fractions 44-47 showed activity, indicating ACE is a relatively non-polar molecule. These fractions were pooled for analysis by LC-MS. Based on preliminary HPLC and LC-MS data, it is possible that ACE is a steroid, which would make it the first sex-specific steroid identified in plants. The future goal is to characterize ACE by NMR. /

Life Science

Poster Number 193: Dayoon Kwon

Imaging hydrogen peroxide in live Aplysia neuronal growth cones using biosensors

Hydrogen peroxide (H2O2) is a reactive oxygen species (ROS) that has emerged as an important signaling molecule controlling a number of cellular processes including cell migration, differentiation, and apoptosis. We have recently shown that ROS are also critical for neurite outgrowth and actin dynamics in neuronal growth cones, which are highly motile structures at the tips of neurites. In order to fully understand the role of ROS in growth cone motility, we need to be able to image and quantify specific ROS with high spatial and temporal resolution. To achieve this goal, we are using the genetically encoded H2O2-biosensor HyPer3. We express this biosensor in Aplysia neurons via microinjection of mRNA and validate it by ratiometric fluorescence imaging while manipulating H2O2 levels in growth cones. Quantifying temporal and local H2O2 changes in neuronal growth cones will be critical to gain a better understanding of how these highly reactive and diffusible signaling molecules control neuronal development and regeneration.

Life Science

Poster Number 194: Sarah Marshall

Inter- and Intra-clonal Comparisons of Schistosoma mansoni Cercariae

Schistosoma mansoni is a human parasite that causes schistosomiasis, a tropical disease impacting over 230 million people worldwide. Each life cycle of the parasite includes sexual and asexual proliferation. Previous research indicates that the genomes of parasites resulting from asexual proliferation are non-identical. It has been suggested that mitotic recombination events during sporocystogenesis creates this heterogeneity in clonal cercariae. Repeats such as transposable elements (TEs) are seemingly responsible for creating such recombinations. Transposable elements are mobile repetitive DNA segments that generate genomic plasticity. In order to test the role of TE's in clonal line variation, we mono-infected snails to generate

clonal cercarial lines, separated the cercariae into males and females, extracted DNA from 10 replicates of each clonal line, and quantified TE copy numbers of the cercariae using qPCR. We hypothesized that mitotic recombinations would create greater copy number variation within individual clonal populations than the average copy number between the different clonal populations. This is because while the variation within a single clonal population should be high, it should average out to be similar to the other clonal populations. We ran the qPCR on three TEs (Saci1, Perere, and Merlin) and used an internal control gene, GAPDH, to compare the copy numbers among the cercariae. Our results indicate there is high variation in TE copy number within each clonal line, and no significant differences between clonal lines, indicating that TEs may be responsible for the non-identical nature of these sexually reproduced stages.

Life Science

Poster Number 196: Paige Cassidy

Investigating the Effects of Schisandrins A and B in a Zebrafish Model of Retinal Degeneration

Retinal degeneration refers to a group of disorders of the retina in which the photoreceptors deteriorate, resulting in a partial or complete loss of functional vision. These diseases are often inherited and are currently incurable; however, their progressive nature provides an opportunity for therapeutic intervention. Several compounds in traditional Chinese medicine (TCM) have been implicated in approaching vision loss prophylactically. Schisandrin A (SchA) and Schisandrin B (SchB) are bioactive compounds isolated from the Chinese five-flavor fruit (Fructus Schisandrae) believed to have such benefits. In previous studies in our lab, a working concentration has been defined for SchB in pde6c, a zebrafish model of human retinal degeneration. In pde6c mutants, the gene encoding a cone-specific phosphodiesterase subunit is altered, producing a defective enzyme and resulting in cone degeneration beginning 4 days post-fertilization (dpf) as well as the death of rods in many cases. Like their human counterparts, these fish are blind. While some success has been found by treating with SchB on its own, the potential synergistic effects of the two compounds have not yet been studied. In TCM, the entire berry of Fructus Schisandrae is consumed, so it is possible that the combination of SchA and SchB may have greater effects than a single compound alone. To do so, several concentration combinations of SchA and Sch B will be developed, and pde6c mutants will be treated from 3 dpf through 8 dpf. From 6 dpf to 8 dpf, a visual motor response (VMR) assay will be performed to determine if the pde6c mutants exhibit an enhanced locomotor startle response to changing light intensity after treatment. If this is the case, then there may in fact be synergy between SchA and SchB. This interplay between the compounds could have broader ramifications in the field of drug development for the treatment of retinal degeneration in humans.

Life Science

Poster Number 197: Daniel Canaria

Investigating the role of BATF in regulating gene expression events important for antibody class switch recombination in B cells

BATF, an immune cell-specific transcription factor, regulates gene expression critical for the B cell process of class switch recombination (CSR). This was previously demonstrated in the lab using a systemic knockout of Batf where the absence of BATF was correlated with the loss of expression of activation induced cytidine deaminase (AID). In addition, RNA-seq was exploited to identify more B cell genes that were likely targets of BATF-mediated transcriptional regulation during this process. BATF-expressing retroviruses were used to reconstitute BATF in the Batf KO B cells and this resulted in re-expression of BATF, re-expression of AID and restoration of CSR. To further investigate the how BATF might function to control the expression of B cell target genes important to CSR, CreERT2; Batf□Z/□Z; RosamT/mG (Izt) mice were produced. We can isolated B cells from these mice and treat them with tamoxifen to induce CRE-mediated deletion of Batf as the cells mature in culture. The RosamT/mG transgene in these B cells will allow us to identify by FACS the cells that have successfully recombined. Our goal is use RT-qPCR to monitor the profile of BATF target genes at different time points relative to tamoxifen treatment (and Batf deletion) to test the hypothesis that BATF is required only to initiate the events leading to CSR and not to sustain the gene expression patterns associated with the efficient production of class switched antibodies.

Life Science

Poster Number 198: James Welch, Emma Foster, Suraj Mohan, Alexa Petrucciani

Isolation and Characterization of Novel Bacteriophage Cosmolli16

Mycobacteriophages are a diverse group of phages, encompassing roughly thirty distinct types that share genome level similarity (Hatfull, 2014). Many have been identified using Mycobacterium Smegmatis to screen environmental samples for mycobacteriophages which were subsequently isolated and sequenced. The novel mycobacteriophage Cosmolli16 was isolated from the West Lafayette, Indiana area in the Fall of 2015 by Giulia Olivieri and Jennifer Nance. After purification and sequencing the annotated genome was then annotated for gene function and function analyzed in respect to its' location within the genome. A better understanding of the structure of mycobacteriophage genomes may answer questions of the evolution and future restructuring. Identification and characterization of the genomes and proteomes of mycobacteriophages may lead to use in the treatment of disease, namely

tuberculosis (McNerney, 2005). Future uses of mycobacteriophages may include better disease identification, genetic engineering and treatment of bacterial infections.

Life Science

Poster Number 199: Yannan Tian

Longbeachae gene knock out using CRISPR

We use Legionella pneumophila as our model, pay attention to its longbeachae gene which contains several genes encode effector belongs to the SidE family. We will use CRISPR to knock out several genes to see what influence it will cause on the bacteria.

Life Science

Poster Number 201: A. Wright, R. Ma, T. Hummer, M. Francis, N. Mehdiyoun, U. Dydak, A. Breier

Magnetic Resonance Spectroscopy Findings in Early-Phase Psychosis

Purpose: Schizophrenia is a psychiatric disorder characterized by disordered thoughts, abnormal social behaviors, flat affect, and auditory or visual hallucinations. The current study aims to investigate alterations in brain metabolism in patients near the onset of psychosis (early-phase psychosis, EPP), to characterize abnormalities during the early stages of schizophrenia. To this end, we used magnetic resonance imaging (MRI) and spectroscopy (MRS) to measure metabolite levels and subsequently monitor the effect of treatment with N-acetylcysteine (NAC). / / Methods: Here we report on the cross-sectional comparison at the baseline scan between 13 healthy controls (mean age = 21.5 yrs) and 28 EPP patients (mean age = 23.9 yrs), within three years of psychotic illness onset. Metabolite levels of glutamine + glutamate (Glx), N-acetylaspartate (NAA), creatine (Cre), and myo-inositol (mI) were measured on a Siemens 3T whole-body scanner with MRS voxels placed in the frontal lobe (size = 2x2x2 cm3; TE = 30ms; TA = 4min). Metabolite levels were quantified using LCModel, and reported in institutional units (i.u.). Comparison of NAA, Cre and Glx levels between the two groups was performed using two-tailed unpaired t-tests. / / Results: A significant decrease of Glx concentration in FEP patients was found (patients: 4.1±1.4 i.u.; controls: 5.2 ± 0.2 i.u.; p=0.04). No significant differences were found at baseline in Cre nor NAA concentrations. / / Conclusion: Significant decreases in Glx were observed in the frontal lobe of the FEP patients. This decrease supports prior research on schizophrenia in similar cortical regions. The alteration in frontal Glx levels may be involved in the behavioral and cognitive abnormalities.

Life Science

Poster Number 206: Sarah Mace

Novel Genetic Loci Control L5 Spine Parameters and Their Response to Low Calcium Intake in Male BXD Recombinant Inbred Mice

Peak bone mass is achieved during adolescence and set by age 20 in humans. Identifying the impact of dietary calcium (Ca) intake and genetics in regulating this peak bone mass is vital to prevent osteoporosis. The purpose of this study was to determine the role of genetics in controlling bone mass and bone response to low Ca intake while ultimately localizing candidate genes. We studied male mice from 51 BXD recombinant inbred lines who were fed either a basal Ca diet (0.5%) or a low Ca diet (0.25%) from 4 to 12 weeks of age. We analyzed four bone parameters: bone volume fraction (BV/TV), trabecular number (Tb.N), trabecular separation (Tb.Sp), and trabecular thickness (Tb.Th) using medium resolution micro-computed tomography. A separate parameter was calculated to reflect the response to dietary Ca restriction (RCR). Using ANCOVA to adjust for body size effects, we found significant line and diet effects for all parameters. For each parameter, the RCR was significantly affected by line, indicating genetics affects bone response to inadequate dietary Ca. Using data from each diet and for the RCR, composite interval mapping was performed using WinQTL Cartographer to identify genetic loci where natural variation affects bone parameters. Many significant and putative QTL peaks were identified and several were found to control multiple parameters. Five loci controlling multiple parameters were further examined. Genes were considered candidate genes if variants altered protein coding or mRNA level. Those expressed in bone cells and with a function related to bone biology were preferentially investigated. Wisp2, a gene known to modulate bone turnover, was identified as a candidate gene within the chromosome 2 locus influencing Tb.Sp and Tb.N. The forward genetics approach utilized in this experiment revealed new genes potentially controlling bone biology. Further investigation can be used to validate the genes identified and translate our findings to the human genome.

Life Science

Poster Number 208: Patrick Gallagher

Paired Competition Analysis using Mixed Models

Urban and rural colonies of odorous house ants (Tapinoma sessile) have very different social structures. Urban colonies are very large with hundreds of cohabiting queens, while rural colonies are small with only one queen. To investigate whether worker ant aggressiveness

varies across these two colony types, an experiment was performed using an aggression assay, in which 50 ants from each of two colonies were placed in a petri dish and allowed to fight. The response was the total number of dead ants within 24 hours (because the ants are the same species, there was no way to determine how many of each colony died). A total of 28 colony pairings, involving 6 urban (U) and 7 rural (R) colonies, were used in the experiment. / Interest is in comparing the three types of pairings (UU, UR, and RR) to see if there is an ordering based on aggressiveness (e.g., mUU < mUR < mRR). A linear mixed model is proposed to account for the fact that multiple assays involve the same colony (i.e., to account for between colony variation in aggressiveness). However, the incorporation of random colony factors is not feasible for this study because of the UU and RR assays. As a result, we perform this mixed model analysis by specifying the covariance matrix (i.e., using the LINEAR covariance structure). A simulation study is used to assess the Type I and Type II errors of this mixed model approach relative to the standard one-way ANOVA. We conclude with an analysis of the real data set.

Life Science

Poster Number 209: Jessica Cleveland

Parasite Response to Host Drought Stress

There is evidence that climate change will result in increased prevalence of disease in humans. Many studies have investigated the influence of unfavorable conditions on disease, but few studies have focused on whether the parasite is able to react to a changing environment in a way that favors its survival and fitness. The goal of this study is to determine the effects of drought, an environmental condition predicted to increase with climate change, on the human parasite Schistosoma mansoni. S. mansoni is a parasite that causes schistosomiasis, a disease that impacts over 230 million people. The parasite has a complex life cycle that uses aquatic snails as an intermediate host, from which the infective stage to humans is released. To better understand how limited water supply affects S. mansoni, we recorded parasite reproduction in drought and control conditions. We predicted that parasites would respond to host stress by decreasing the amount of time taken to reproduce and by producing more offspring. It was found that parasite reproduction is significantly increased in drought conditions. Our findings suggest that increasing prevalence and severity of drought may cause increased numbers of adult parasites in the host population, thus increasing disease burden among humans.

Life Science

Poster Number 210: Joshua McGraw

Protein Multiple Sequence Alignment via novel scoring methods

Through computational analysis, we demonstrate positive correlations between amino acid Multiple Sequence Alignment length, mutual information, Shannon's entropy, and number of closely interacting residues among the 3-Dimentional structure of local protein regions. Thus allowing us to create a novel MSA scoring alignment algorithm which maximizes these values.

Life Science

Poster Number 213: James Welch

Restoration of Mature let-7 MircoRNA Through Small Molecule Discovery

MicroRNA's (miRNA) are a class of small non-coding RNA molecules that pair non-perfectly with messenger RNA to repress protein translation. Most miRNAs are transcribed and then processed twice, firstly by the RNAse enzyme Drosha and then by Dicer. Although all miRNAs share this mode of biogenesis, an additional layer of processing has been identified for one miRNA family, the let-7 family. Let-7 processing by Drosha and Dicer is blocked when unprocessed let-7 is bound by the RNA binding protein LIN28. Because fully processed let-7 family members act to repress the oncogenic genes RAS, MYC and LIN28, which are involved in differentiation, proliferation, and development, reduced mature let-7 levels contribute to uncontrolled growth in cancer. We hypothesis that small molecules can be discovered that interfere with LIN28-let-7 binding which would then allow mature tumor-suppressive let-7 to be produced. A library of FDA approved compounds will be tested for their ability to disrupt the let-7-LIN28 interactions in a high-throughput screen using a fluorescent polarization assay. Positive hits will be examined in cell culture and eventually chemically refined in an attempt to increase affinity. The crystallography structure of LIN28 bound to let-7 has been solved and shows a large binding pocket that recognizes a GGAG motif found in all let-7 family members. Modeling in silico has resulted in several small molecules that mimic the GGAG structure. These rationally designed small molecules will also be tested using the fluorescent polarization assay.

Life Science

Poster Number 214: Abigail Perkins

Sea Lamprey Feeding in Captivity

Sea lamprey in certain habitats have been controlled using the chemical 3-trifluoromethyl-4-nitrophenol (TFM). This study is the first in 28 years to look at the chemical effects of sea

lamprey to the chemical. Sea lamprey will be tested from three locations. Lake Michigan has used TFM for 57 years to treat the sea lamprey population, Lake Champlain has used TFM for 30 years, and the Connecticut River has never been treated with TFM. Sea lamprey diet is an area of interest. Past studies that keep sea lamprey in captivity use a yeast based diet when feeding the sea lamprey. Sea lamprey do not eat yeast in their natural habitat. Instead, sea lamprey eat a mix of organic dendrites, mud, and plankton. Different mixtures of algae and yeast will be fed to the sea lamprey. The different mixtures will reveal the optimum algae to yeast concentration to increase sea lamprey survival in captivity.

Life Science

Poster Number 215: Nickoulas Cooper-Garcia, Kayla Kollman, Evan Billings, Cara Christense, Yannan Tian, Caitlin Cherry, Jade Keane

Social Complexity - Relating Communication and Behavior to Social Intelligence in Carolina Chickadee and Tufted Titmouse

The social complexity theory in avian species has shown to be affected by flock size and social pressures, but lacks further research in comparing communication and behavior complexes across species. Observing how individuals interact and communicate within a flock and population should reveal unique social systems. We recorded population dynamics in three structurally different study sites by banding the two species, recording daily vocals, and focal sampling interactions between an individual and its surroundings. We hope to find an extensive communication system between the species and data supporting a vocal system and a reoccurring, intelligent response.

Life Science

Poster Number 216: Melissa Casella

Src-Mediated Phosphorylation of Aplysia Cortactin

Src-mediated phosphorylation of Aplysia cortactin / / Melissa Casella, Yingpei He, and Daniel M. Suter / / Department of Biological Sciences, Purdue University, 915 West State Street, West Lafayette, IN 47907, USA / / Cortactin is an actin-binding multi-domain protein and substrate for Src tyrosine kinase with many functions including cell migration, endocytosis, and tumor cell metastasis. The ability of a cell to migrate in response to stimuli involves dynamic regulation of the actin cytoskeleton. Recent work from our laboratory revealed that both Src2 and phosphorylated cortactin are critical for controlling actin organization and dynamics in Aplysia neuronal growth cones; however, we do not have any direct biochemical evidence that Src2 phosphorylates cortactin in Aplysia. We have used cortactin co-immunoprecipitation and

immunoblotting to address this problem. Using protein lysates from Aplysia central nervous system tissue, we were unable to demonstrate an interaction between Src2 and cortactin thus far. Furthermore, immunoblotting with an anti-phosphotyrosine antibody did not reveal any phosphorylated cortactin. We are currently setting up radioactive kinase assays that will use Aplysia Src2 expressed in CHO cells and immunoprecipitated with a goat-anti-Src2 peptide antibody. We have purified bacterially expressed 6-histidine-tagged Aplysia cortactin, which will be used as Src substrate in the kinase assay. Kinase reactions will be analyzed by SDS-PAGE, autoradiography, and immunoblotting. We expect that wild type Src2 phosphorylates Aplysia cortactin, while a kinase-defective mutant of Src2 does not. Future studies will identify which specific tyrosine in cortactin is phosphorylated by Src2.

Life Science

Poster Number 217: Nicole Biddinger

Structural Studies of Phospholipase C Regulation

Cardiovascular disease is the leading cause of death in the United States, and phosopholipase C epsilon (PLC epsilon) has been recently linked as a vital enzyme involved in both normal cardiovascular function and in processes like cardiac hypertrophy. PLC epsilon is part of the PLC superfamily, which is composed of enzymes that hydrolyze phosphatidylinositol-4,5-bisphosphate (PIP2) to generate second messengers inositol-1,4,5-triphosphate (IP3) and diacylglycerol (DAG.). These molecules regulate intracellular Ca2+ levels and protein kinase C (PKC) activity. PLC epsilon is present in the cytoplasm with low activity under basal conditions, but this mechanism of regulation is unknown. PLC epsilon is activated up to 10-fold following stimulation of G protein-coupled receptors through interactions with small GTPases, and this activation may involve conformational changes in the regulatory domains that may increase the affinity of the catalytic core of the enzyme for the membrane. However, PLC epsilon is rather large, which requires its expression in insect cells. Fortunately, PLC210 - the invertebrate homolog of PLC epsilon - has the same GTPase activation and domains, including CDC25, PH, EF hands, TIM barrel, X-Y linker, RA1 and RA2 domains, but does not have additional residues in the N terminus that PLC epsilon has, making it a better model system for understanding the structure and function of PLC epsilon. Through a series of PLC210 variants lacking regulatory domains in comparison to the full-length version, it is hoped insight can be gained into why PLC epsilon has low basal activity, and a high-resolution structure can eventually be determined.

Life Science

Poster Number 218: Jianing Fu

Structural Studies on Rubella Virus p90 protein

Rubella Virus (RV) is a pathogenic agent that cause disease Rubella, which is also known as German measles. The viral infections during pregnancy can also cause severe birth defects in new born infants. RV p150 and p90 proteins are two essential component proteins for viral replication. But the structure of the proteins are still unknown. Here we describe the attempts to discover the atomic structure of the RV p90 protein, including PCR and Molecular Cloning, protein harvest and protein purification. Intein tag, Maltose-Binding-Protein (MBP) tag and His tag are three major protein tags which were attempted during research. Insolubility was observed before purification in the use of intein tag, while instability was observed in Molecular Cloning in the use of MBP tag with His tag. Through multiple pull-downs successful purification band was observed in the use of MBP tag only. This information can be used for further investigations that target the p90 protein.

Life Science

Poster Number 219: Hannah Stewart

Symbiotic Effects on Termite (Reticulitermes flavipes) Caste Differentiation

The eastern subterranean termite, Reticulitermes flavipes, is an important structural pest which has symbiotic relationships with bacteria and protists in their guts. Symbionts help termites perform a variety of functions. Juvenile Hormone (JH) is a signal for worker termites to differentiate into pre-soldiers, and then soldiers. It is unknown if symbionts play a role in caste differentiation. My hypothesis was that symbionts affect termite soldier differentiation. First, I evaluated the effect of four treatments on termite differentiation: untreated control, antibiotic alone, JH alone, and antibiotic + JH. Termite survivorship and pre-solider differentiation were recorded for three weeks. Next I tested if trophallaxis, a social behavior, could improve survivorship by symbiont replenishment. Three groups were given JH and compared for survivorship and differentiation over three weeks: an untreated control, an antibiotic treated control, and a mixed group of half untreated and half antibiotic treated. Finally, to determine natural symbiont fluctuations during differentiation, termites from three colonies were treated with JH and protists were counted over time. The results suggest there may be an optimal concentration of protists needed for differentiation, i.e. too few protists and termites die, but high protist titers may impede differentiation. This research represents the first steps toward discerning the link between symbionts and termite caste differentiation. Both symbiosis and

eusociality are integral aspects of termite biology, and as such understanding them is critical to understanding, controlling, and exploiting these insects.

Life Science

Poster Number 221: Yoonhee Nam, Seungyeon Jeong

Synthesis of 15-hydroxyprostaglandin dehydrogenase inhibitor and synthesis of oligopeptide (Asp)10 using solid phase peptide synthesis

Prostaglandin E2 (PGE2) is a lipid molecule involved in various signaling pathways that promote tissue regeneration. It has great potential in tissue-regenerating applications, but PGE2 is unstable, raising concerns in direct dosage. Here, we have synthesized a stable small molecule inhibitor (SW033291) for a prominent negative regulator of PGE2 in vivo, 15-hydroxyprostaglandin dehydrogenase (15-PGDH), which oxidizes prostaglandin at the 15' position and deactivates it. Naturally, the inhibition of 15-PGDH should reduce the amount of deactivated PGE2, which in turn promotes the inherent tissue-regenerating physiological functionalities of PGE2. Thus, this molecule is a potential candidate for various tissue repair drugs. In this present study, we have synthesized SW033291 from commercially available starting material 2-cinnamoylthiophene by repeating a published synthetic route. Decent yields have been achieved throughout the steps, and the target molecule has been obtained and purified successfully with an overall yield of 21 %. Another experiment that has been done is the synthesis of oligopeptide (Asp)10 using solid phase peptide synthesis, further expanding the targeting possibilities for SW033291. In this relatively large-scale synthesis, we started with 4 grams of 2-chlorotrityl chloride resin and have achieved an average 94 % coupling efficiency in each coupling. The final oligopeptide has been cleaved off the resin fully protected, precipitated and washed in cold ethyl ether, and analyzed with UHPLC-MS.

Life Science

Poster Number 222: Varun Subramanyam

The effect of lignin composition on the cell wall polysaccharides composition and cell-cell separation in poplar woody biomass.

The world's environmental and economic problems are making it clear that it is imperative to study alternative sources of energy, like biofuels and the production of lignin, and polysaccharides. Poplar is one tree model studied for its high biomass and fast growth. Three different lignin variants were obtained: High syringyl (S)-Lignin, High G-Lignin, and Hydroxyl G-Lignin, via molecular engineering of lignin biosynthetic pathways. The purpose of this study is to analyze how these mutants affect cellulose and hemicellulose polysaccharide compositions, as

well as cell-cell separation. Various assays were used to study polysaccharide composition. One method is the preparation of alditol acetates for sugar analysis of hemicellulose. Cellulose concentration is determined by nitrate acetic acid, and phenol sulfuric assays. A fourth assay to determine the amount of intact cells released from tissues subjected to sequential chemical extractions of cell wall components called acid chlorite-alkaline assay was also developed. Our results showed that cells only separate upon treatment with acidified sodium chlorite followed by dilute alkali. Furthermore, cells from transgenic poplar with high S-lignin content separated more easily than wild-type wood. Sugar analysis of material extracted by dilute alkali revealed the presence of xylans and a minor amount of rhamnogalacturonan-I, which may interact with lignin to play a key role in cell-cell adhesion in poplar. We also hypothesize that the High S-Lignin variants will have higher sugar production and therefore better biofuel conversion. Our work provides new insights in lignin modification to enhance yields of biofuels from genetically modified biomass.

Life Science

Poster Number 223: Janise Unger

The Effects of DNA methylation on Chromatin Condensation

The hierarchy structure of chromatin condensation has been unknown and studies have yet to determine the intermediates between the “beads on a string” structure and the fully condensed chromatin. The “beads on a string” model depicts 146 base pairs of DNA wrapping around a histone octamer. It is the focus of this experiment to examine the transition from this structure to the proposed 30nm chromatin fiber of packed nucleosomes. Former studies conducted in Doctor John Anderson’s lab have shown that DNA methylation tightens the interaction between the DNA and the histone it wraps around. Gene depression is widely associated with heterochromatic regions of the genome where there is heavy methylation. We are further exploring if DNA methylation can also enhance chromosome condensation. It is our speculation that methylation will also play a role in the condensation of poly nucleosomes.

Life Science

Poster Number 224: Maggie Wigren

The effects of resource availability on reproduction, competition and disease susceptibility in a native and invasive zooplankton

It is widely known that parasites can severely harm a host population, and identifying the factors that can enhance or inhibit diseases is crucial for management of disease in wild populations. Metschnikowia bicuspidata is a yeast that commonly infects freshwater

crustaceans in North America (Daphnia sp.) and is lethal to them. The environment can potentially alter Daphnia-Metschnikowia interactions as well. In a series of laboratory experiments, we investigated how resources (food availability) can influence direct and pathogen-mediated competition between two species of Daphnia: the native D. dentifera and the invasive D. lumholtzi. We first measured the influence of pathogen spore production, where young Daphnia (neonates) were exposed to Metschnikowia and were given various amounts of food. In the low food treatment, we observed high mortality, decreased body size, and a trend towards decreased spore production. This pattern may have been caused by fewer resources for the Metschnikowia to grow and reproduce in the low food treatments. Next, we investigated how varying food treatments can affect the reproductive rates of both species both species. The number of offspring produced by each individual Daphnia will be measured and compared among treatments and clones. The number of offspring produced by each individual Daphnia will be measured and compared among treatments and clones. Finally, we are also investigating how competition between Daphnia species is affected by varying levels of food and parasite presence. We are using 3 species treatments with D. lumholtzi only, D. dentifera only, and both species together. Infection status and population densities will be measured. Combined, these studies may have implications for how changes in resource availability could influence reproductive rates, competition, and disease susceptibility. /

Life Science

Poster Number 225: Katherine Strelau

The transcription factor MIST1 regulates secretory cell homeostasis and stress responses through newly identified target genes

Pancreatic acinar cells produce large amounts of protein and can cause pancreatic diseases if they undergo cell stress. If there is a buildup in the amount of misfolded proteins in the cell, a cell state termed ER stress ensues. This initiates the Unfolded Protein Response (UPR), a series of cell changes governed by the activation of transcription factors that enable the cell to adapt to the elevated workload and survive the added stress. The UPR has recently been shown to activate the transcription factor MIST1, a protein linked to maintaining secretory cell health. Our goal was to establish the role that MIST1 plays in combating ER stress and regulating secretory cell homeostasis. / / Genome-wide screening was performed in order to identify possible MIST1 gene targets. Cell culture techniques were then used to investigate MIST1's effect on these putative targets. It was found that induction of MIST1 resulted in the altered expression of genes directly related to secretion and ER stress recovery. It was also determined that MIST1 was capable of regulating the UPR as a whole, controlling the expression of other transcription factors responsible for diminishing the negative effects of ER stress. In conclusion, MIST1 not only regulates the overall homeostasis of the cell, but it also directly controls UPR

target genes and the UPR itself. Our research on the role of MIST1 in the UPR pathway has great importance in the medical field in terms of developing drugs to combat stress-related pancreatic diseases.

Life Science

Poster Number 226: McKeith Pearson

The yeast endocytic proteins epsin (Ent2) and the Huntingtin-Interacting Protein 1-homolog (Sla2) cooperate for the regulation of cell division

Huntington's disease is one of the several neurodegenerative disorders caused by expansion of the number of glutamines (Q) present in the protein huntingtin. Research has extensively focused on the toxic gain-of-function phenotypes acquired by the Q-expanded huntingtin. However, loss-of-function effects (inability to fulfill biological functions) that also result from Q expansion lead to neurodegeneration. / The purpose of this project is to address the question of how the polyQ in huntingtin function to mediate protein-protein interactions. Although yeast does not have a huntingtin homolog, Q-rich regions are present in the endocytic protein epsin and the Ent2 paralog is crucial for the regulation of cell division. Importantly, the yeast homolog of the huntingtin binding partner HIP1 (Huntingtin Interacting Protein 1), known as Sla2, binds epsin. This further supports the idea that epsin's Q-rich regions may functionally replace huntingtin Q stretches in yeast. / Using microscopy and extensive image analysis, here we show that Ent2 dominant negative (E2DN) constructs (lacking C-terminal determinants) induce cell division defects in a Sla2-dependent manner. Conversely, truncations of the C-terminus of Sla2 suppress the E2DN-dependent phenotype. Further, our data suggest that Q-rich regions of Ent2 and the second coiled coil domain (CC2) of Sla2 is necessary for this regulation of cell division. / To summarize, we have discovered the first physiological function of Q regions in endocytic proteins. We believe that this research will provide important insights into the function of Q that are disrupted upon expansion. /

Life Science

Poster Number 228: Seungyeon Jeong, Yoonhee Nam

tissue regenerating drugs

Prostaglandin E2(PGE2) is a lipid molecule that is involved in various of signaling pathways the would promote the tissue regeneration. The theoretical papers has proven that PGE2 can be used for tissue regenerating. However, it is a highly toxic compounds and it is unstable in vivo. Thus the new methods that take advantage of the tissue regenerating is in need of direct

dosage. / In our research, we start to synthesize the small molecule inhibitor (SW033291) for a for a prominent negative regulator of PGE2 invivo, (recently reported potent 15-PGDH inhibitor), followed by in vivo test of its tissue regenerate efficacy. The 15-PGDH inhibitor reduces the amount of deactivated PGE2, which will promotes the inherent tissue-regenerate the physiological functionalities of PGE2. Thus this will be used as a various tissue repair drugs. / Also we have synthesized SW033291 from commercially available starting material 2-cinnamoylthiophene by repeating a published procedure. We have reached the decent yield have throughout the steps, and the target molecule has been obtained and purified successfully with an overall yield of 21%. We also synthesized the oligopeptide (ASP)10 using solid phase peptide synthesis. /

Life Science

Poster Number 230: Kathryn Reinhart

Us vs. Them: Competition in the Human Parasite Schistosoma Mansoni

Scientists and health professionals looking to manage parasitic disease require a basic understanding of parasite ecology. Parasites often coexist with other parasites within a host, and the interaction between these individuals can affect the intensity of disease, here referred to as virulence. The nature of the interaction can also affect the parasite's survival and reproduction, and thus the transmission of the parasitic disease. Kin selection theory predicts that closely-related parasites will be less competitive, will not exploit host resources as intensely, and will therefore have lower virulence than a population of unrelated parasites. Our experiment focused on the effect of competitive interactions on parasite virulence and transmission for the human parasite Schistosoma mansoni. To investigate the impact of competition on parasite virulence in the mammalian host, we exposed 18 lab mice to a suspension of parasites that contained either all-related parasites from a single strain or less-related parasites from two distinct strains.. Host morbidity and parasite reproduction were used to measure virulence and transmission. Our results illuminate the competitive dynamics of S. mansion parasites during infection of the mammalian host. The validity of kin selection theory in the context of this particular host-parasite system will be discussed. /

Life Science

Poster Number 234: Devang Thanki

Water Contaminated with Atrazine Alters Expression of TPD52L1 with The Zebrafish Model

Atrazine is a commonly used herbicide in the Midwestern United States. Currently, Indiana uses about 26 percent of its land to grow corn, and atrazine is used in ample amounts, resulting in

runoff that leads to contamination of drinking water. The Environmental Protection Agency has set the Maximum Contaminant Level (MCL) at 3 parts per billion (ppb) in drinking water but the herbicide is often found at higher levels. However, data suggests that atrazine can be harmful even at 3 ppb. Previous studies from our laboratory have shown atrazine alters gene expression associated with neuroendocrine and reproductive system function, carcinogenesis, and cell cycle regulation following developmental atrazine exposure at 0.3, 3, or 30 ppb. From these studies, it was shown that at 72 hours post fertilization (hpf), atrazine elicits alterations of the gene, tumor protein D52 (TPD52L1) in the zebrafish. Previous studies have identified TPD52L1 in cell proliferation and calcium signaling, along with regulating expression at the G2-M transition in breast cancer cells. The goal of this project was to characterize the expression of TPD52L1 during development of the zebrafish, as well as determine genetic alterations caused by developmental atrazine exposure. To characterize the expression of TPD52L1 throughout embryogenesis, zebrafish embryos were bred and embryos were collected at 24, 36, 48, 60, and 72 hpf. In addition, alteration in TDP52L1 gene expression following atrazine exposure was assessed at the same developmental time points. Analysis showed consistent levels of gene expression throughout embryonic development, a significant increase at 36 hpf in the 0.3 and 3 ppb treatments and significant increase at 60 hpf in all three treatments. This indicates that TPD52L1 expressions are induced by atrazine exposure at specific developmental time points. Western blot analysis is now being completed to determine if the gene expression changes are translated to protein alterations.

Life Science

Poster Number 236: Alexandra Bianco

What is the role of Interleukin-4 in lymph node organization?

Interleukin-4 (IL-4) is a cytokine that is a marker of both type 2 helper T cells (Th2) and T follicular helper cells (Tfh), and is an integral part of B cell differentiation and immunoglobulin class switching. Although IL-4 is known as a key regulator of type 2 immune responses, a detailed understanding of its influence on lymph node organization is lacking. To investigate this problem, the effects of induced type 2 immunity on the organization and population of lymphocytes was observed in normal (BalbC and 4get) / mice and mice that lacked IL-4 (Kn2) and the IL-4 receptor (IL4RKO). Confocal microscopic imaging was used to examine the organization of popliteal lymph nodes in BalbC and Kn2 mice by determining the location of B and T cell regions and the presence of germinal centers and stromal cells. A Th2 response was induced in 4get mice and IL4RKO mice using a soluble egg antigen from the Schistosoma mansoni parasite (SEA). Flow cytometry was then used to analyze the different cell types present. Through these investigations, it was found that Kn2 mice demonstrate smaller B cell regions in comparison to those animals with normal levels of IL-4 production. It was also

observed that the absence of the IL-4 receptor results in a reduction of T Follicular helper cells and germinal center B cells in response to an SEA induced Th2 response. This initial data suggests that IL-4 plays a major role in lymph node organization during the immune response. /

Life Science

Poster Number 150: Leonardo Azopardo, Sarah E Thomaz

Visualizing Dessins d'Enfants on the Torus

A Belyi map f: P^1(C) \to P^1(C) is a rational function with at most three critical values; we may assume these values are {0, 1, infinity}. A Dessin d'Enfant is a planar bipartite graph obtained by considering the preimage of a path between two of these critical values, usually taken to be the line segment from 0 to 1. Such graphs can be drawn on the sphere by composing with stereographic projection: f^(-1) ([0,1]) < P^1(C) = S^2(R). Replacing P^1 with an elliptic curve E, there is a similar definition of a Belyi map f: E(C) -> P^1(C). The corresponding Dessin d'Enfant can be drawn on the torus by composing with an elliptic logarithm: f^(-1)([0,1]) < E(C) = T^2(R). / / In this project, we use the open source Sage to write code which takes an elliptic curve E and a Belyi map f to return a Dessin d'Enfant on the torus -- both in two and three dimensions. Following a 2013 paper by Cremona and Thongjunthug we make the elliptic logarithm E(C) = C/L explicit using a modification of the arithmetic-geometric mean, then compose with a canonical one-to-one correspondences C/L = T^2(R). Using this, we focus on several examples of Belyi maps which appear on Elkies' Harvard web page entitled ``Elliptic Curves in Nature.'' / / This work is part of PRiME (Purdue Research in Mathematics Experience) with Leonardo Azopardo, Maxim Millan, and Sarah Thomaz with assistance by Edray Goins and Avi Steiner. /

Mathematical/Computational Science

Poster Number 172: Jen Werner

Deconstructing Cation-pi Interactions:
Understanding the Binding Energies Involved with Metals and Benzene

The Effective Fragment Potential (EFP) method is a computationally efficient technique for describing non-covalent interactions, such as hydrogen bonding and van der Waals forces. Cation-pi interactions are a type of non-covalent interactions and are thought to be important in biological processes, such as permittivity of ion channels. The goal of our work is to establish that the EFP method reliably describes the strength, directionality, and composition of the simplest geometric conformation of a cation-pi interaction. Optimal geometries were found for each cation (K+, Li+, Na+, Ca2+, and Mg2+) paired with benzene using the MP2 level of theory

and cc-pVTZ basis set, aside from benzene and K+ which used the 6-311G** basis set. Then for every 0.2 angstroms between 1 and 7 angstroms of separation, the cation was displaced along a line normal to the face of the benzene ring. EFP and Symmetry-Adapted Pertubation Theory (SAPT) calculations were executed for each distance. Adjustments were made to both the electrostatic and polarization energy calculations in EFP. The binding energies and energy components from both were compared. SAPT2+ was used as a reference for EFP. It was found that the EFP method is able to accurately predict the binding energy of cation-pi interactions involving benzene along the given trajectory. This implies EFP has the potential to be expanded to cation-pi interactions in larger systems.

Mathematical/Computational Science

Poster Number 184: Clayton Jacobs

Exploratory Study of Complementary Pairs of Epistemic Actions in an Introductory Level History Courses

In order to understand a student's relationship with technology better, one must look at the different types of interactions that student has with an educational software. Those types of interactions are more or less better for learning than other interactions, so we must research which interactions when paired together created the effective learning model for a student in an introductory university level history course.

Mathematical/Computational Science

Poster Number 200: Zhuo Chen

Machine Learning on Financial Market

This research project is using machine learning techniques to simulate trading on financial market. It used several financial indicators (MACD, KDJ, etc) to generate discrete rules. Then the rules portfolio will be mined using different machine learning models involving Naive Bayes Classifier, Multi-Layer Perceptrons and Deep Learning. The trained models will be applied for testing data to simulate trading. The model that generate the best result will be recorded for future use. This project will also compare the performance of different machine learning models and choose the best one.

Mathematical/Computational Science

Poster Number 202: Bryan Rainey

Massive Graph Processing on Tiny Computers

Many of today's graph-processing frameworks utilize powerful computer clusters with dozens of cores. We process massive graphs on inexpensive, low-power computers, including the Raspberry Pi, Scaleway, and the Kangaroo. Due to memory constraints on these tiny computers, our implementations of PageRank and connected components stream graphs from an external disk while performing computation. The $100, 2-by-3-inch Kangaroo can compute PageRank on the 1.5-billion-edge 2010 Twitter graph as quickly as leading graph-processing systems running on machines with up to 48 cores. We also demonstrate that these computers are capable of computing PageRank on graphs as large as the 43-billion-edge ClueWeb12 crawl. As people continue to apply graph computations to large datasets, we suggest that efficient, scalable computation does not always require sophisticated systems or hardware.

Mathematical/Computational Science

Poster Number 205: Peter Boyd, Brian Kidd, Christopher Vincent, Weston Phillips

NFL Playoffs: A Probability Model with Simulations

We consider the question of how important winning the first game of the season is to making the playoffs for an NFL team. We analyze this question both statistically and probabilistically. First we examing historical data from past NFL seasons to consider whether the first week of the season is any more important than other weeks of the season. Secondly, we attempt to explain probabilistically how winning in any given week changes the probability of that team making the playoffs. /

Mathematical/Computational Science

Poster Number 227: Jack VanSchaik, Kristen Mori

Theory and Application of a Central Limit Theorem for Acoustic Indexes for use In Soundscape Ecology

Soundscape ecology is a newly developing field. Derivative of landscape ecology, soundscape ecology is the study of the summation of sounds emananting from a landscape. Major themes for research in Soundscape Ecology include improvement of measurement and quantificaiton of sounds, as well improving our understanding of spatial temporal dynamics across different scales. / / One of the main analytical tools in the Soundscape Ecologist's toolkit is the set of acoustic indices. These acoustic indexes are mathematical functions or algorithms applied to

one or more sound recording files such as a wav or flac. There are two types of acoustic indexes alpha indices and beta indices. The alpha-indices are used to quantify acoustic properties of a single recording. The beta-indices are used to compare acoustic properties between multiple recordings. These indices are useful because they allow us to look at the summation of sounds produced by the environment, which is exactly how we defined the Soundscape. / / In this paper, we attempt to rigorously define soundscape recordings in mathematical and statistical terms. Primarily, the purpose of this paper is to present an application of the Central Limit Theorem for M-Dependence to Acoustic Indexes. We show that Acoustic Indices with certain properties converge to a normal distribution. This is useful for constructing confidence intervals and hypothesis testing. We are then able to infer information about the acoustic properties of the environment given only a single Acoustic Index value to a level of quantifiable level fo statistical significance.

Mathematical/Computational Science

Poster Number 233: Sarah Thomaz, Leonardo Azopardo

Visualizing Dessins d'Enfants on the Torus

A Belyi map f: P^1(C) \to P^1(C) is a rational function with at most three critical values; we may assume these values are {0, 1, infinity}. A Dessin d'Enfant is a planar bipartite graph obtained by considering the preimage of a path between two of these critical values, usually taken to be the line segment from 0 to 1. Such graphs can be drawn on the sphere by composing with stereographic projection: f^(-1) ([0,1]) < P^1(C) = S^2(R). Replacing P^1 with an elliptic curve E, there is a similar definition of a Belyi map f: E(C) -> P^1(C). The corresponding Dessin d'Enfant can be drawn on the torus by composing with an elliptic logarithm: f^(-1)([0,1]) < E(C) = T^2(R). / / In this project, we use the open source Sage to write code which takes an elliptic curve E and a Belyi map f to return a Dessin d'Enfant on the torus -- both in two and three dimensions. Following a 2013 paper by Cremona and Thongjunthug we make the elliptic logarithm E(C) = C/L explicit using a modification of the arithmetic-geometric mean, then compose with a canonical one-to-one correspondences C/L = T^2(R). Using this, we focus on several examples of Belyi maps which appear on Elkies' Harvard web page entitled ``Elliptic Curves in Nature.'' / / This work is part of PRiME (Purdue Research in Mathematics Experience) with Leonardo Azopardo, Maxim Millan, and Sarah Thomaz with assistance by Edray Goins and Avi Steiner.

Mathematical/Computational Science

Poster Number 173: Dalton Chafee, Joshua Leeman, Ryan Baker

Designing Particle Detector Modules for the High-Luminosity Upgrade of the LHC

The Large Hadron Collider (LHC) at CERN is the preeminent place in the world for research in particle physics, slamming particles together at collision energies of up to 13 TeV. However, as the boundaries of human understanding are pushed ever further, higher instantaneous luminosities must be reached. The high-luminosity (HL) phase of the LHC, with expected installation in the 2020s, will achieve this goal, but it comes with certain challenges: among them, a complete redesign of the current silicon detector modules that surround the collision point. These modules will have to withstand a larger particle flux after the HL-LHC upgrade compared to those currently in the detector. The goal of our research is to design, build, and test a module configuration that can withstand the additional heat caused by the higher particle flux. In order to achieve this goal, we are taking a two-fold approach: develop a thermal model of heat dissipation of possible low-mass detector designs in SOLIDWORKS and build physical prototypes for thermal testing. Currently, mock thermal simulations on simple solids and gases are being run to enhance our knowledge of the program. Meanwhile, carbon fiber sheets have been built for use in the physical prototype. Ultimately, we will determine an optimal shape and material composition in order to meet the needs of the HL-LHC upgrade.

Physical Science

Poster Number 190: Douglas Miller

Global Atmospheric Response to Arctic Amplification Using Pre-Industrial Climate Model Integrations

Arctic Amplification (AA) states that the Arctic region is warming twice as fast as the global average. There could be potential effects that this mechanism has on our global climate, in particular, the mid-latitude general circulation. An increase of temperature and heavy rainfall has occurred since the 90's, however recently, extreme colds have taken over some mid-latitude regions, for example, the winter of 2014. Some recent studies attributed the increased frequency of extreme weather events to AA while others disagreed. Therefore, this study aims to better understand the Northern Hemisphere (NH) mid-latitude atmospheric response in association with AA. A 500-year CMIP5 GFDL pre-industrial model integration is used. With composites of anomalously warm and anomalously cold years over the Arctic region, surface air temperature, zonal wind, precipitation and sea ice concentration were examined globally.We have found that the surface air temperature in general decreases in the NH mid-latitude continents (although not statistically significant) associated with anomalously warm Arctic

years. In addition, the tropospheric jet stream shifts equatorward, in particular, over the North Pacific Ocean and the stratospheric polar vortex experiences cooling and acceleration. Anomalous precipitation is also identified in the tropical region as well as the NH mid-latitudes. The only significant region of sea ice concentration loss occurs over the Barents-Kara Sea. Similar conclusions are also found in the NCAR WACCM model integration.

Physical Science

Poster Number 203: Samuel Higginbotham

Measurement of the top quark-antiquark spin correlations at 13 TeV using the CMS detector

Measurements of the correlation of the spins of the top quark and top antiquark for top quark-antiquark pairs in proton-proton collisions are discussed. Spin correlations are sensitive to a variety of new physics contributions and could be enhanced compared to the standard model expectation. For example, the bosonic structure of the hypothetical supersymmetric Top quark would produce a different spin correlation distribution compared to the standard model top quark thus measuring the spin correlation can be a valid test for supersymmetric particle searches. This search is described and advanced methods for unfolding to the parton level using Tikhonov regularisation is discussed. These spin correlation measurements require a large resolution, so unfolding to account for acceptance and detector effects are worth exploring. Dilepton final states are employed to measure angular distributions in data accumulated with the CMS detector at a center-of-mass energy of 13 TeV. The angular distributions of the leptons are unfolded to the parton level and used to extract the spin correlation coefficient. Results are compared to the standard model prediction to study potential new physics contributions.

Physical Science

Poster Number 204: Macy Mullen

NASA MARCO POLO Atmospheric Processing Module

Part of NASA's In-Situ Resource Utilization (ISRU) effort includes the MARCO POLO lander (Mars Atmosphere and Regolith Collector/Processor For Lander Operations). MARCO POLO is a relatively new project, just a couple years old, and still in the early developmental phase. This lander is comprised of different compartments such as soil, water and air processing units. Our focus here at Kennedy Space Center (KSC) is the Atmospheric Processing Module, or APM. The APM converts the CO2, which largely comprises Martian atmosphere (95.32%), to produce methane and water vapor. This process starts with obtaining pure CO2 by freezing it out of the atmosphere using a cryocooler, one cycle (1.4 hr) produces about 94 g of CO2 (s). After the freezing cycle, a heater sublimates the CO2 and it is sent to a Sabatier reactor to produce the

CH4 and H20 (g). Our conversion rate has been 90% with a production of 5.5 L/min of methane. From here the methane will be stored as fuel and the water is planned to be electrolyzed. Even though we currently have a full set-up of the cryocoolers, chillers, reactor, and qualitative and quantitative instruments, we still face many challenges. Our future goals for the system is to make it more efficient, reconfigure it for a more compact design, overcome software bugs, and eventually rewrite the software to make the system completely autonomous.

Physical Science

Poster Number 207: Timothy Waite

Optimized-Binary Compressive Detection Raman Spectroscopy

Optimized-Binary Compressive Detection (OB-CD) is a filtering method that allows collection of Raman data faster than conventional spectroscopic methods. The system utilizes a Digital Mirror Device (DMD) which consists of hundreds of mirrors in array that can be toggled between 2 positions. In the original OB-CD system, the light from the DMD was reflected onto a photomultiplier tube (PMT) or into space. A PMT absorbs and enhances the captured photons allowing for analysis of the Raman data. A newly developed filtering method (OB-CD2) applies the same principles, but reflects the light onto 2 PMTs simultaneously as opposed to losing any light. When compared to the original OB-CD, it was shown that OB-CD2 has improved signal to noise for classifications of up to four different chemicals. This greater signal to noise allows for faster, more accurate measurements

Physical Science

Poster Number 212: Nicholas Pogranichniy

Rapid protein crystal characterization using intercalation of second harmonic generation active dyes

High-throughput protein crystallization assays are integral to the process of protein detection and characterization in the pipeline of rational drug design. Large costs are associated with this process, in both time and resources, as a myriad of proteins are tested using a myriad of crystallization conditions with each one in the effort to find diffraction quality crystals. Yet, many techniques used to find such crystals incur false-negatives due to the variation in the emissive properties of crystals. Second harmonic generation (SHG) proves a useful tool for rapid characterization of protein crystallinity, as the phenomenon occurs in highly ordered systems and not in amorphous aggregate, because it is specific to crystalline media lacking inversion centers. Although ~84% of protein crystal structures give detectable SHG signal, one of the drawbacks to the method are the few crystal forms in which SHG emission of light is forbidden

or is too weak to be measured easily. It has been found that the intercalation of SHG active dyes, or SHG-phores, into the crystal lattice of proteins can enhance the SHG response from dark crystals by greater than 1000-fold within minutes of the SHG-phores' introduction to the system, and that there is no background contribution from solvated dye or dyed aggregate, as there would be with fluorophores. Furthermore, this dyeing technique was applied to a variety of different crystallization conditions prior to crystal nucleation and was found not to adversely affect the formation of protein crystals within the margin of error. Adding the dyes also allows for the characterization of the size distribution of crystals in solution as well as assessment of crystalline quality, something that techniques such as dynamic light scattering cannot provide. This usage of SHG-phores significantly increases the diversity of protein crystals amenable to SHG, some of which cannot be detected as quickly or easily via other methods.

Physical Science

Poster Number 220: Zhengjia Tong

Synthesis and Reactivity Study of Uranium Mono-, Bis-, Tris- (imido) Complexes

The study of uranyl analogues has received a surge of attention in recent years; one of many analogues is uranium imido species. Previously, our group has first reported the synthesis of uranium mono-, bis-, and tris-(imido) complexes aided by a supporting redox non-innocent ligand: pyridinediimine. Thereafter, a more facile synthetic route using potassium graphite as reductant has been discovered by our group as well. With a variety of novel imido complexes the characterizations and reactivity studies become important in elucidating the chemical nature of uranium. Namely, the ability of uranium tris(imido) to undergo ligand metathesis with compounds containing functionalities such as ketones, aldehydes, sulfides, nitro, and isocyanates was investigated. Proton, carbon NMR spectroscopy and mass spectroscopy were hence utilized to study of the structure of the organic products. The results suggest that the U—N multiple bonds are indeed reactive. The ability to synthesize uranium(VI) bis(imido) species from uranium(VI) tris(imido) complexes are also being investigated currently. The study of the high-valent uranium complexes helps elucidate on the covalence of uranium whose unique features have the potential to lead to unprecedented chemistry.

Physical Science

Poster Number 229: Anav Gagenja, Jordyn McCord, Michael Mavity, Holly Maize, Sabeen Nadir, Mike Stepanovic, Margaret Hegwood

Universal Method for Analysis of Counterfeit Medication

The selling of counterfeit drugs in Tanzania poses a major problem. It is common for drugs to be sold by vendors in markets throughout Tanzania; however, often, these drugs are counterfeit, mimicking the size, shape, and packaging of genuine drugs without offering the desired efficacious effect. These counterfeit drugs waste resources, put individuals at risk of continued illness and discourage individuals from purchasing genuine and life-saving drugs. With the research being conducted by this Global Development Team, a universal method for distinguishing between counterfeit and non-counterfeit drugs in Tanzania is being developed for a variety of commonly used medications. The team has also created training materials for the project with implementation at the Kilimanjaro School of Pharmacy in Tanzania. High Performance Liquid Chromatography (HPLC) is used to compare samples of drugs to standards to test for the presence of the active pharmaceutical ingredient (API) of each drug. Various solvent and buffer solutions were researched and chosen with the hopes of simplifying the method and easing the implementation in Tanzania while still allowing for the testing of many drugs. Using the pure component of each drug obtained from the United States Pharmacopeial (USP), chromatograms have been collected from the HPLC and can be used as standards for the project. Although the methods presently being used seem to be working, they are extremely specific. Continued research focuses on further simplifying the methods, adding additional medications to the counterfeit detection capabilities and making the project even more universal.

Physical Science

Poster Number 231: Mackenzie McAdams

Using Historical Photographs to Study Glacier Change

Glaciers in costal Alaska are undergoing rapid changes that affect global sea level rise and the local landscape. A key to understanding these current changes and their future impacts is a long time series of data on the glaciers. In recent years, a wealth of satellite data has allowed us to document glacier behavior, but this data becomes increasingly sparse as you go back in time. Historical photography is a tool that can extend the glacier time series much further into the past. Ralph Tarr, a professor of geography at Cornell University, and his colleagues, lead several expeditions to study glaciers in southern Alaska during the first decade of the 20th century. Members of these expeditions used innovative photography techniques for their scientific

studies, and brought back thousands of glass plate images. These images have been digitized through a joint Purdue-Cornell project. Many of these images have never been available in digital form before, providing an invaluable resource for research. / / Over the past four semesters, I have been working to categorize these images. Using Google Earth and historic maps, I have closely analyzed and determined the specific locations from which photos were taken. These locations will be attached to image files in an online database that will be made available for use by researchers. I have also mapped the termini positions of glaciers. These maps can be used to estimate the magnitude of glacier change, and provide a strong visual on the impact of our changing landscape. /

Physical Science

Poster Number 232: Megan Neary

Verification of groundwater flow paths by means of heat: How long will pupfish survive in the desert?

East of the Sierra Nevada mountains and west of Las Vegas lies one of the most dramatic landscapes in the U.S.A. Alternating basins and ranges reveal the complex geologic history in this arid region. Death Valley, one of the driest places in this country, is located here and is the focus of study in this poster. However harsh this environment may be, various species of pupfish (Cyprinodon) have survived in secluded desert ponds for hundreds of thousands, perhaps millions of years. In fact, the complex tectonic activity in the region is likely responsible for the geographic and reproductive isolation that led to speciation in the desert pupfish. They currently live in groundwater-dependent springs and associated spring-runs. Little is known about the groundwater flow paths that support these spring systems and metrics describing spring resilience to climate perturbations are lacking. In addition, one conceptual model suggests that interbasin groundwater flow may support springflow in parts of the study area. This complicates our understanding of spring resilience. However, much of this research has focused on using groundwater residence times and/or geochemistry to test these conceptual models. I propose that these conceptual models can be tested using a statistical analysis of water heat signatures discharged at springs. I compare heat signatures of water discharged at several springs with regional environmental lapse rates and with geothermal gradients. I then calculate circulation depths of groundwater using geothermometers to compare with ELR and geothermal gradients. The results of these analyses are used to test conceptual models of groundwater flow and interbasin groundwater flow in the region.

Physical Science

Poster Number 155: Anthony Adams

Age on Behavior models

Adolescents exposed to maltreatment (abuse and neglect) by caregivers and other adults are more likely to behave aggressively. These aggressive behaviors may be expressed differently, for example, through physical or verbal actions. These behaviors also may have different trajectories due to developmental stage and relevant ongoing experiences in adolescence. Using data from the National Survey of Child and Adolescent Well-Being (NSCAW), a longitudinal study which surveyed 2,776 subjects between the ages of 11-17 who were in contact with Child Protective Services for possible maltreatment, we developed measure for four types of aggressive behaviors (physical, verbal, and sexual toward others and physical toward property) using confirmatory factor analysis. Trajectory models were estimated to determine the pattern of change for each aggressive behavior type between age 11 and 17. Most forms of aggression remain stable in adolescents, but verbal aggression increases in middle adolescence. Some sex differences exist and the different types of aggression trajectories are correlated. This study will go further into looking at children in maladaptive homes to determine which maltreatment types are associates with different forms of aggressive behaviors and changes in those behaviors.

Social Science/Humanities

Poster Number 211: Emma Sevigny

Pumé modern hunter-gather diet analysis

My project specializes in the analysis of the observations and diet choices of the modern hunter-gatherer tribes, the Pumé and the Batek, using Excel and R. I have been converting the weight of the hunted returns and converting them to calories obtained. I then compare the data to an optimization graph to see if they are truly foraging optimally. If not, then I ask, "What do I not understand"? This is where the project gets interesting as we try to determine what is causing these people to not forage optimally. Many times it is a need for other nutrients, like proteins, that cause humans to hunt instead of going for other calorie rich options.

Krannert School of Management

Social Science/Humanities

Poster Number 239: Oswin Chackochan, Hannah Abell-Junior

VertiKale

There are 23.5 million people in the United States that live in food deserts. A food desert is defined as a community living farther than one mile from a supermarket or grocery store in urban areas and more than 10 miles away in rural areas. Many food deserts occur in impoverished areas. This makes purchasing fresh fruits and vegetables even more difficult for individuals in these areas as prices of these items are often higher than the less healthy alternatives. / / VertiKale will provide accessible and sustainable produce to communities living in food deserts. This will be accomplished by producing food using a combination of aquaponic and hydroponic systems inside currently unutilized buildings located in food deserts around the United States.

Innovative Technology/Entrepreneurship/Design

Poster Number 238: Christine Rasquinha

Can Case Competitions Breed Success in Internships and Future Competitions?

Students looking for a job are caught in a catch 22. They approach possible employers with their elevator pitch and are told that they need more experience. After, they try to receive experience from a different company and are told they need experience for that internship as well. Case competitions, a shortened version of an internship that lasts between 24 hours to 3 weeks, are unique opportunities for both students and recruiters to bridge the gap. It is an application of their school work focused on solving company problems. For recruiters, it is a cost friendly way to view dozens of students for under the $8000 it would take to hire one student for the summer. The research problem at hand is how do case competitions impact a student's ability to acquire work experience and succeed in future ventures. To identify the impact, three key research methodologies were used—online surveys, focus groups, and observations. The online survey questions were aligned with the focus group to ensure the validity of focus group responses and also to gather more participants. The results of the research indicated that students' participation in case competitions was a key talking point in interviews and that students who receive any mentorship early had a higher likelihood of placing first, second or third in future case competitions. The implications of the answer are that the current case competition program must be grown through mentorship to encourage

new students to achieve the experience they need to succeed in future case competitions and acquire internships.

Purdue Polytechnic Institute

Social Science/Humanities

Poster Number 240: Lakshya Garg, Yichen Zhong, Muhamad Hafiz Hussin

Evaluation of Functionality and appropriateness of a Cloud-based solution for some Purdue online Map-Based Decision-support system.

The ABE Department has several map-based decision support sytems (L-THIA, Load Duration Curve, Purdue STEPL, etc.) . Computationally these models are based either in-house on ECN servers or elsewhere on campus in the ITAP virtual server cluster. This includes Windows and Linux operating systems, and scripting languages like Python and PhP and JavaScript. Both of those IT situations require ABE provide upgrades, maintenance, and 24/7 oversight. This project will evaluate the appropriateness, ease of use, and functionality of a particular cloud-based solution for some of these online decision support tools. The goal is to move either the models or the non-computational pages to a cloud-based server where maintenance is not responsibility of ABE. This will probably require using a service-based (REST) architecture on the Purdue side of the models, to communicate with the cloud-based portion of the model (perhaps just HTML and JavaScript pages).

Innovative Technology/Entrepreneurship/Design

Poster Number 241: Austin Partin

Surface Nanocrystallization and Numerical Modelling of Low Carbon Steel by Means of Ultrasonic Shot Peening

Surface nanocrystallization of AISI-1018 steel was successfully realized by ultrasonic shot peening (USSP). The fabricated nanocrystalline surface layer were observed and characterized by means of Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM). Experimental evidence indicates that after USSP, the initial coarse-grained structure (~20μm) at the top surface layer was refined into equiaxed ultrafine grains with random crystallographic orientation and the elongated grains were observed at the sub-surface layer. Nano grains (~100 nm) and nanocrystalline surface layer with the thickness of 1 were fabricated after USSP treatment of 20 minutes. By increasing the USSP treatment duration to 60 min, nano grains in the size of 20nm and nanocrystalline surface layer with the thickness of more than 10 were generated. To predict the generation of nanostructured surface layer by plastic strain, an

analytical algorithm cooperating with finite element method was proposed to simulate the strain distribution and surface topography of the peened surface during USSP. The proposed algorithm was verified and the simulation results show a reasonable agreement with the experimental results.

Innovative Technology/Entrepreneurship/Design

Poster Number 243: Sanjun Eom

Smart Systems Technology on Tupperware using Electronic Substrate

Smart systems technology is a part of smart products that enables other capabilities of the product outside its physical device. It often associates with processors, sensors and wired/wireless connections to make the product more efficient, intelligent and innovative. In this project, we focus on implementing an embedded system that will form the backbone of "Smart Tupperware", the storage organizer of the future. Of paramount interest to this project is the ability to display information to the user in extremely low power and robust manner. The prototype system will be based on an "electronic substrate" that will provide a flexible test vehicle for structured exploration of design parameters. The electronic substrate will consist of a flexible circuit board suitable for high temperature applications with CPU, wireless communications, and interface circuitry for flexible displays in various configurations. Some sensors such as temperature or humidity sensors are likely to be incorporated into the design. The electronic substrate will be embedded in various container systems in cooperation with Tupperware product engineers and manufacturing personnel.