

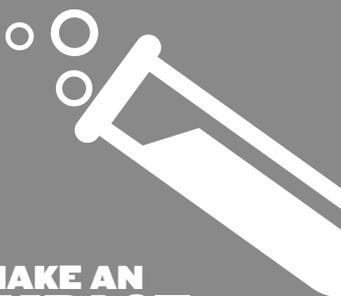
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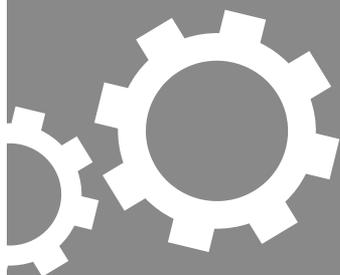
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Agriculture

Poster 1: Jiai Zhang

“Isolation and characterization of phage for the detection and control of non-O157:H7 STECs”

According to the FDA, Shiga-toxicogenic Escherichia coli (STECs) are a big concern for public health causing about 170,000 illnesses in the United States annually. O157:H7 is the serogroup responsible for most foodborne disease among the STECs. However non-O157:H7 STECs such as O26, O45, O103, O111, O121 and O145 cause approximately 112,000 cases (60% of STEC infections, i.e.) in the U.S. annually. Bacteriophage have been used in a variety of food safety applications for the control of O157:H7. Therefore finding bacteriophages to control non-O157:H7 STECs to improve food safety is critical.

In this study environmental sources were used as source material for the isolation of phage. After initial isolation using a standard plaque assay, purified and concentrated phage were characterized by determining their host range. Based on the host range results DNA from potentially unique phage was extracted using a phenol chloroform extraction after CsCl purification/concentration of the phage. The phage DNA was cut with restriction endonucleases and the resulting digestion patterns were used to identify similar phages. A DNA sample from each unique phage was submitted for whole genome sequencing. The host range and digestion patterns suggested 7 potentially distinct phages. The sequencing data was analyzed to confirm the number of unique phages and further characterize each one. These new phages can potentially be used in the food industry to detect and/or control STECs to reduce the incidence food borne illness.

Poster 2: Megan Raderstorf

“ Effects of Cold Shock on Boar Semen”

There is a growing interest and need in having the ability to stabilize, freeze and or store boar semen for an extended period of time. The first step in research-

ing is to look at the effects of various temperatures on the stability of the sperm cell. A two-by-two factorial design was used where boar semen was collected, extended in either a short-term or long-term extender (BTS and Androhep), and stored at either 17°C or 12°C for 7 days. For evaluation, a semen sample was warmed to 37C for 30 minutes prior to evaluation using a computer-assisted semen evaluation system to record motility and progressive motility of the sperm cells on day 0 (day of collection), 1, 2, 5, and 7.

A phase-contrast microscope was used to visually examine the sperm cells for morphological abnormalities on the same days. Data was analyzed using analysis of variance for repeated measures in SAS v9.3. Motility and progressive motility were decreased in the 12°C treatment at all time points ($p < 0.001$ for both). Motility was greater on day 0 compared to day 1 ($p = 0.007$), 5 ($p = 0.007$), and 7 (0.005). Progressive motility was greater on day 0 compared to day 1 ($p = 0.005$), day 5 ($p = 0.0007$), and 7 ($p = 0.0015$). Additionally, Motility was greater on day 2 compared to day 5 ($p = 0.017$) and 7 ($p = 0.025$). Overall, it appears that storage temperature impacts motility and progressive motility of sperm cells, despite being warmed to 37C.

Poster 3: Brittney Offenberger

“The Effects of Betaine on BTS and Androhep Plus Semen Extenders”

Researchers are interested in finding new ways to increase shelf-life of boar spermatozoa stored in commercially available extenders.. One method of investigation is to supplement the extenders with various compounds. Betaine is a water-soluble compound that acts as a methyl donor which could potentially interact with the proteins on the sperm head or in the plasma membrane to effect the motility or mobility of spermatozoa. A long-term extender, Androhep Plus, and a short-term extender, BTS, were supplemented with three levels of betaine: high, medium, and low. Semen was collected once a week from two boars for the course of 4 weeks, extended in the supplemented extenders, and stored in a 17C incubator. For evaluation, a sample of the stored semen was warmed to 37C for 30 minutes and analyzed using a computer-assisted semen evaluation system evaluating the motility, mobility, and morphology of the

spermatozoa at day 0 (day of collection), 1, 2, 5, and 7.

Data was analyzed using analysis of variance for repeated measures in SAS v9.3. The high level of supplementation greatly decreased motility ($p < 0.001$) and progressive motility ($p < 0.001$). This level also resulted in a significant increase in morphological abnormalities of the spermatozoa. The medium level of supplementation was not different than the low for overall motility, but was less than the low group in progressive motility ($p = 0.055$). The medium and low levels of supplementation did not differ in morphological abnormalities. Overall, betaine supplementation appears to have a threshold at which it can become detrimental to the cells. More research is warranted to evaluate whether betaine can have added benefits as a supplement to semen extenders.

Poster 4: Ashley Ochs

“Developing and Validating a RT-qPCR Multiplex to Detect for Turkey Coronavirus”

Turkey Coronavirus (TCV) is detrimental to the Turkey Industry in US. It is a highly contagious virus for which there currently is no cure, and creates huge economic losses. In the market today, there are no reliable PCR assays to test for the virus. That fact called for the development of a RT-qPCR assay that is reliable, repeatable, specific, and sensitive, as well as relatively inexpensive, to use in diagnostic settings. The particular test we have developed involves multiplex real time polymerase chain reaction, which is the use of more than one primer probe set to detect for multiple genes. While this research is still ongoing, the level of detection for the multiplex has been determined, and it has been deemed repeatable and reliable. Testing for sensitivity and specificity has yet to be completed.

Poster 5: Moriah Massafaro

“Modification of soybean silencing vector, pSM103, to express RFP instead of GFP”

The soybean silencing vector, pSM103 was developed for artificial microRNA (amiRNA)-gene silencing assays via the production of transgenic hairy roots. Our lab wishes to use this vector to study the genetics of resistance to the fungal pathogen *Fusarium virguliforme*, the causal agent of soybean sudden death syndrome. Before this can be done, the vector needs to be modified to carry the red fluorescent reporter, DsRed1, instead of GFP (green fluorescent protein), which is expressed by the isolate of *F. virguliforme* that will be used in the assays. Restriction enzyme sites present in the DsRed1 cassette, but also in pSM103 and are used for inserting various amiRNAs, must be modified before inserting into the pSM103 vector. PCR site-directed mutagenesis and TOPO TA cloning were used to accomplish these tasks.

Poster 6: Rae Chan

“Detection of *Escherichia coli* O157:H7 in leafy greens using bacteriophage V10 Lux”

Escherichia coli O157:H7 is a foodborne pathogen causing bloody diarrhea and hemolytic uremic syndrome. Its occurrence in ready-to-eat salad mix, baby spinach, and romaine lettuce, which are normally consumed uncooked encourages development of rapid and inexpensive tests that can be used to screen samples for the presence of this organism. We previously constructed a bacteriophage (Î|V10 Lux) that specifically infects *E. coli* O157:H7 and transduces the luxCDABE gene cassette from *Photobacterium luminescens*. Selective enrichment cultures positive for O157:H7 will bioluminesce and can be detected by a luminometer. We have screened a number of O157:H7 isolates, including those from leafy greens, for their transduction by Î|V10 Lux. This study is based on the protocol described in the FDA BAM Chapter 4A, section K. Romaine lettuce was stomached in a 1:10 ratio with modified Buffered Peptone Water containing pyruvate with an Acriflavin-Cefsulodin-Vancomycin supplement. Samples were spiked with *E. coli* O157:H7 C7927 and Î|V10 Lux, incubated statically at 37Â°C and assayed for luminescence using a Zylux luminometer every hour. After 6 hours, samples with the highest concentrations of *E. coli* O157:H7 (105cfu) were luminescing, and by 12 hours, samples with concentrations of O157:H7 as low as 103cfu gave a positive result as well. The

FDA BAM calls for an enrichment of 18 to 24 hours before real-time PCR. This method of using ^{13}C V10 Lux offers a rapid putative positive while preserving the samples for further conformation.

Poster 7: Claire Burtch

“The polyphenolic profiling of a variety of red wines”

Grape phenolics are critical to wine quality attributes including color and flavor. Additionally, the health benefits of wine consumption have been associated with specific polyphenolic compounds in wine. The phenolic composition of red wines is known to be dependent on grape variety, region of growth and vinification technique. In the Eastern United States wine is made from grape species including *V. vinifera*, *V. labrusca*, *V. aestivalis*, *V. rotundifolia* and hybrids with *V. riparia*. While information on the phenolic composition of European species (*V. vinifera*) has been documented, much less is known about these other economically important varieties. A more detailed understanding of compositional differences is required to better understand the impact to both wine quality and potential health benefits. The objective of this study was to characterize the phenolic compositions of 29 red wines made from both traditional and hybrid grape varieties. Wine samples made in the Purdue Enology Laboratory between 2004 and 2013 were diluted in 2% acetic acid (1:2) and analyzed by LC-MS. Traditional grape varieties were found to produce wines of higher phenolic content (618-2354 mg L). Overall, caffeic acid was highest in Tannat wines (761 mg L) relative to other wines (139-591 mg L). Caffeoyl tartaric acid, an ester of caffeic and tartaric acids, was found in the second highest concentration (108-803 mg L) being most abundant in hybrid wines produced from Noiret and Norton. The characterization of the phenolic composition of this variety of wines produced from traditional and hybrid grape varieties provides needed insight into quality and potential health attributes of wine.

Poster 8: Monica Bomber

“Generation of Transgenic CHD5 in Zebrafish”

Epigenetic factors are now known to play an important role in tumorigenesis.

CHD5 is a vertebrate specific ATP-dependent chromatin remodeler that has been identified as a tumor suppressor in mice and humans. Loss of CHD5 is associated with cancers such as neuroblastoma, melanoma, prostate, ovarian, and lung cancer (Bagchi, 2007). Neuroblastoma is an extra-cranial tumor from the sympathetic nervous tissue that typically develops during embryogenesis. Zebrafish have transparent embryos born outside the body making them an excellent model system to observe developmental defects that may correlate between CHD5 and neuroblastoma. To study this possibility we are testing the hypothesis that CHD5 acts as a tumor suppressor in zebra fish. In order to examine the role of CHD5 in zebra fish, transgenic lines with over-expressed activity and suppressed activity of CHD5 have been created by use of the transposon-based Tol2Kit. These lines are being identified for germline transformation.

In order to determine which zebra fish were transformed, they were identified by either a heart-specific GFP fluorescent marker for heat-shock fish or full body GFP fluorescence for CMV fish. The first generation of transformed fish (T1) are being bred and their offspring (T2) are being screened for fluorescent progeny to identify those lines that are passing on the transgene to their offspring. As stable transgenic lines are identified, their offspring will later be phenotypically analyzed for possible characteristics caused by presence of the transgene. The transgenic fish with the heat-shock promoter will be heat-shocked and then observed for phenotypes of interest at different time points. By understanding how CHD5 functions in zebra fish, it may be possible to develop new therapies for CHD5-dependent cancers in humans.

Poster 9: Alyssa Strumpf “Intestinal Stem Cells”

Research indicates that normal colonic stem cells are the cell of origin for colon cancer. Intestinal Stem Cells (ISC) are the only intestinal cells that persist for over 96 h and so they can accumulate mutations throughout a lifetime and pass them to daughter cells. ISC isolation and culture techniques are needed to study the process and prevention of carcinogenesis. We combined information from several studies to optimize 3 steps in ISC culture: crypt isolation, ISC isolation,

and culture conditions.

We used transgenic mice with the promoter for the ISC-specific gene *Lgr5* driving EGFP expression to fluorescently mark ISC. EDTA was used to dissociate crypts from small intestine (SI); these crypts were successfully cultured in Matrigel. SI crypts were digested, and single, viable ISC were isolated by flow cytometry. Culturing single ISC in Matrigel was optimized using chemicals to inhibit GSK3, activate Notch signaling, and inhibit apoptosis to allow ISC to self-renew without differentiating. Removal of these chemicals from medium induces ISC differentiation. For the colonic ISC, the issue of balancing single cell isolation with cell death required modification of the SI isolation protocol. Colon crypt digestion did not produce viable, single cells, so manual disruption was employed. Also, optimal cell culture required addition of Wnt3A to activate Wnt signaling and permit colon ISC to self-renew but not differentiate. However, these conditions were still less effective than conditions for SI ISC culturing. Our optimized ISC culture conditions remove a barrier to further mechanistic studies on colon carcinogenesis.

Poster 10: Alyssa Hilligoss

“High tunnel production of specialty cut flowers in the Midwest influences yield and stem quality”

In the United States, the most traditional cut flower stems (*Rosa* spp., *Dianthus caryophyllus*, *Dendranthema ×grandiflorum*, and *Alstromeria* spp.), are imported from Central and South America. This has provided cut flower growers in the U.S. with the opportunity to satisfy their consumers' request for the more unique specialty cut flowers. These species must be grown near their market, because they are more fragile; therefore they are unable to be shipped long distances. In order to provide quality stems for the consumer, growers have looked to high tunnel production instead of traditional field production, because this method has several benefits. *Celosia argentea* L. var. *cristata* 'Bombay Firosa', *Antirrhinum majus* L. 'Potomac Lavender', *Dianthus barbatus* L. 'Amazon Neon Purple', *Campanula carpatica* 'Campana Deep Blue', *Gomphrena pulchella* 'Fireworks', *Tanacetum parthenium* 'Matricaria Snowball Vegmo Extra', *Eustoma*

grandiflorum 'Lisianthus ABC 3 White', and *Moluccella laevis* were grown in both field and high tunnel environments in the Midwestern U.S.

For many cultivars, marketable stems harvested per square meter increased and time to harvest (TTH) decreased in the high tunnels compared with the field. However, stem caliper, inflorescence length, and flower width showed more variation among cultivars. Our results indicate that cut flower yield of marketable stems significantly increases when produced in high tunnels versus field plots located in the Midwest.

Poster 11: Alexis Zobel

“Evaluation of Flu DETECT® Swine Influenza Virus A Antigen Detection Test Kit”

Swine Influenza Virus (SIV) is a major pathogen among the swine population. Subtypes of the virus include H1N1 and H3N2. The pig is thought to be a mixing vessel for the virus to spread from birds to humans through mutations in the virus (Vincent, et al., 2066). The Flu DETECT® Swine Influenza Virus A commercial test kit was used to detect influenza virus type A from nasal swabs. The test utilizes antibodies specific for type A swine influenza virus to capture the viral proteins. By testing the Swine Influenza Virus Type A Antigen Test kit on samples submitted to the ADDL for testing by well-characterized Polymerase Chain Reaction as a reference test, we were able to analyze the specificity and sensitivity of the test.

The results of this study indicate that the test kit is relatively reliable for detecting swine influenza A on nasal swabs when the virus is above a concentration of approximately 1000 viral particles per ml and has 100% specificity when this minimum concentration of virus is present in the sample. The data suggests that the test had high specificity to the virus, but lacked the sensitivity to detect the virus in low concentrations present in the samples. Further tests need to be developed to increase sensitivity of the assay to detect influenza virus at the pen side. Developing a more sensitive test for the influenza type A virus will help veterinarians detect infections more accurately in the different stages of disease

and virus shedding from animal.

Education

Poster 12: Tanner Givens

“Community Involvement at an Elementary School: Cultural Differences and Their Effect on Education”

The objective of this service-learning research project is to link the University, a local elementary school, and the Greater Lafayette community to enhance k-12 students’ academic involvement. The participants involved were 36 pre-service teachers from Purdue University, 12 faculty members from a local elementary school, and the students and parents affiliated with the elementary school.

To answer the research question of how to bridge the cultural gap between students and teachers and using critical theory as the theoretical paradigm, the following methods were employed: interviews, classroom observations, involvement in an after school program, and reflections of the experience. The pre-service teachers interviewed and observed teachers within the school context, and then made connections between what they were learning in their teacher education course at Purdue and what they heard and observed in the elementary classrooms, during the interviews, and at the after-school activity.

The pre-service teachers also had conversations and wrote reflections about the differences they discovered. They also observed the challenges that arise when teachers instruct students from diverse backgrounds. Using this information, the Purdue students contributed to an after school family event in which they ran educational games for the elementary students to participate in. Following the event, the pre-service students presented their feelings about the project to their peers and the potential strategies they believe the teachers could pursue. The results suggest that cultural differences within this context construct language barriers and instructional obstacles. However, increased communication

and involvement between parents and teachers can bridge this gap.

Engineering

Poster 13: Max Youngs

“Exploring experimental methods to measure the efficacy of voltage biasing in the rat auditory cortex.”

Intracortical Microstimulation (ICMS) is a promising clinical treatment for patients suffering from sensory loss, however, penetrating electrodes in the neocortex have been limited by the immune response of the central nervous system. The application of a voltage bias, termed rejuvenation, is hypothesized to reduce the glial scar and has been shown to reduce the electrical impedance created by this tissue interface. Previous research has yet to show the histological effects of rejuvenation.

This study utilizes novel characterization methods, behavioral thresholds and histology, to investigate this relationship. The efficacy of these techniques is evaluated here. Before and after the rejuvenation protocol, frequency response analysis (FRA), cyclic voltammetry (CV), and thresholds were measured; afterwards the rat was perfused. Sliced brain sections were stained with antibodies to identify various glial cell populations and neurons.

Preliminary findings suggest that much of the encapsulative glial tissue remains near the implant site with increased immune response throughout the nearby tissue. Behavioral data suggests little change to the perceived experience for the subject, while impedance and charge carrying capacity exhibited the previously documented relationship. Improved histological techniques and additional subjects will be necessary to adequately assess rejuvenation as a method to improve the longevity of ICMS devices.

Poster 14: Zhiwei Wu

“Active Dense Tensegrity Structure: A Novel Concept For Shape

Morphing Systems”

Active shape morphing system is of relevance for advanced engineering devices such as wing applications. The present work proposes an active Dense Tensegrity structure as the active system using Shape Memory Alloy (SMA) wire to induce shape morphing on Dense Tensegrity, a structure assembled of cables carrying tensions only and polyhedral elements under compression only.

Active Dense Tensegrity is desired to possess significant differences in bending stiffness (K) when considering the bending direction (up down). Dense Tensegrity structure was manufactured using tetrahedra particles as the compression elements, and carbon fibers as the tensional cables such that an assembly in a dense planar array was obtained. Three types of polyhedral elements were considered: regular and homogeneous tetrahedra, Truncated tetrahedra, and Janus-type tetrahedra made of part soft and hard solid. For assemblies of regular tetrahedra, the Tensegrity possessed the same stiffness in both bending directions (K, upward K, downward=1 due to symmetry), while for the Tensegrity of the Truncated tetrahedra (K, upward K, downward =25.2) and of the Janus-type tetrahedra (K, upward K, downward=4.7), significant bending stiffness asymmetries were realized.

SMA wires were integrated into Dense Tensegrity with a span-wise manner as the actuator. Experiments were performed on Tensegrity with Truncated tetrahedra. Results showed that SMA wires were capable to induce controlled bending deflection. Various types of Truncated tetrahedra were generated with different percent of cut-off portions, and they are 33%, 25%, 15%, and 0%-off (regular). Active response from the experiments revealed that the maximum bending deflection are 24 mm, 14 mm, 8 mm, and 0 mm for samples with above portions respectively.

Poster 15: Kevin Vuong

“Determination of Ignition Delays in Hypergolic Rocket Propellants”

Hypergolic rocket propellants are fuels and oxidizers that ignite shortly after contact without external ignition sources. This inherent reactivity, storability

as liquids, reliability, and repeatability make hypergolic rocket systems relatively simple in comparison to other systems that use cryogenic propellants. However, these chemicals are often corrosive, toxic, and carcinogenic, making new higher energy density and lower toxicity hypergols highly desirable. An important parameter that must be measured in these new hypergolic propellant combinations is ignition delay since without rapid and repeatable ignition, potentially damaging hard starts may occur from the buildup of propellant in the chamber.

An apparatus termed as the Hypertester has been built to measure this ignition delay. The setup relies on dropping a single droplet of the oxidizer into a crucible containing the fuel. A piezoelectric impact sensor then registers the time at which the droplet makes contact with the liquid pool, after which a photodiode records the time at which light from ignition first appears. The difference between these measurements in time is taken to be the ignition delay. This setup allows for simple way to measure the ignition delay between various hypergolic propellant combinations. Additions will be made to the Hypertester that will allow it to trigger a high speed and high-resolution spectrometer, which will in turn provide spectral data of the hypergolic combustion events.

Poster 16: Christopher Schweitzer

“Bio-Fuels: Upgrading Bio-Oils For Use As An Alternative Energy Source”

With increasing concerns over the economics and environmental hazards of petroleum-based fuel sources, alternative sources of energy are being studied at a rapidly increasing rate. One major field of alternative energy research is bio-fuels. An area that is currently seeing an increased level of effort and interest is the process of upgrading bio-oils to bio-fuels through catalytic hydrodeoxygenation (HDO). A significant challenge in developing these conversion processes is the complex nature of bio oils; more than 400 oxygenated organic compounds can be found in bio-oils.

Preliminary research efforts in the conversion of bio-oils to bio-fuels have concentrated on the use of model compounds to develop the catalysts and process-

ing steps required. This poster will focus on one of the primary components of bio-oils, guaiacol. Using guaiacol as the model compound, a series of experiments were designed to identify the promising catalyst based on the following critical factors: (1) degree of deoxygenation, (2) hydrogen consumption, (3) carbon recovery, and (4) catalyst stability. The results showed that Pt C (among Pt, Ru, Rh and Pd on carbon catalysts) exhibited the most promising results with high guaiacol conversion (>90%), high carbon recovery (>70%), and limited catalyst deactivation.

Additional work was completed to determine the optimum operating temperature for the hydrodeoxygenation reactions using Pt C catalyst. In order to provide a more complete understanding of the catalyst behavior, deactivation studies were performed on Pt C and other catalysts. Preliminary results of continuing work on reaction pathways and kinetics will also be discussed.

Poster 17: Austin Scherbarth

“Effects of Core/Shell Structure on Oxygen Storage and Catalytic Properties of Metal-Oxides”

Core shell nanoparticles were synthesized using precipitation and self-assembly methods, with TiO₂ (titania), CuO (copper oxide), and ZrO₂ (zirconia) as the core, and CeO₂ (ceria) as the shell, in order to observe the effect of core shell structure on oxygen storage and catalytic properties. Ceria, along with other metal oxides, has been studied extensively because of its catalytic properties and oxygen storage capacity (OSC). Core shell particles allow for combination and alteration of the properties of both the core and the shell materials. By combining these metal oxide particles in a core shell structure, the catalytic and oxygen storage properties were altered and compared to metal oxide nanoparticles without a core shell structure.

X-ray diffraction (XRD), Brunauer-Emmett-Teller (BET) surface area analysis and transmission electron microscopy (TEM) methods were used to characterize the nanoparticles and confirm their chemical composition. Thermogravimetric analysis (TGA) was used to measure the oxygen storage properties of the particles. The metal oxide core shell nanoparticles were observed to have higher

oxygen storage and catalytic properties than single material particles based on the TGA measurements and this was attributed to the alteration in characteristics resulting from the interaction between the core and shell materials.

Poster 18: Noah Salas

“A Comparison of Airport Operations Estimates for Non-Towered Airports from Two FAA Sources”

Accurately estimating aircraft operations at general aviation airports is crucial knowledge for the aviation industry in order to make safety, financial, environmental, and planning decisions. However, accurate estimates are difficult to obtain, especially for non-towered general aviation airports. There have been attempts at modeling small-towered airport data to estimate the operations at non-towered airports that have been funded by the FAA and the Transportation Research Board. This study focused on characterizing US non-towered airports by analyzing the most current Terminal Area Forecast (TAF) and the FAA Airport Master Record (Form 5010) databases.

The TAF contains operations forecasts at airports, while the FAA Form 5010 data is a count of operations over the course of a year as reported by local aviation authorities. Samples of the operations reported for non-towered airports were collected for the airports that occurred in both databases. A paired t-test of the data revealed a significant difference between the operations estimates. In a search for a description of a typical non-towered airport, descriptive statistics of non-towered airports are presented and discussed using data available on either the TAF or FAA Form 5010. A better understanding of the characteristics for non-towered airports may serve to develop future operations models that may reduce the differences in operations reported for non-towered airports in the two datasets.

Poster 19: Patrick Pawletko

“Community Power from Micro-Hydropower Systems: A Capacity-Building Project in Bangang, Cameroon”

Energy is one of the most vital resources for the socioeconomic development of any community. Cameroon has the second greatest potential for hydroelectric production in sub-Saharan Africa; however, a mere 2.1% of that potential is developed, and less than 12% of Cameroonians have access to electricity. In the village of Bangang, there are four small hydropower projects in various stages of development. Development of these hydropower systems has begun with two fully operational turbines, but the projected capacity has yet to be achieved. The current turbine efficiencies are substandard, resulting, in part, from the lack of exhaustive engineering design.

This research aims to evaluate the current systems and to use the resulting data to improve existing community hydropower system designs. To reach this goal, an interdisciplinary undergraduate service-learning team collaborated with a community-based non-governmental organization (NGO) to design, test, and fabricate two cross-flow hydropower turbine prototypes with an estimated 60 kW capacity each. The first device, which was fabricated at Purdue University according to provincial constraints, suffered a catastrophic failure event after three weeks of testing under real-world conditions on location in Cameroon. The second device, which incorporated critical design calibrations derived from local knowledge, was fabricated at the NGO headquarters in the village over an eight-week period using local materials and labor; it has remained fully functional for the seven months since installation.

Building upon past successes, research now focuses on replicating these results with the creation of a universally sustainable economic framework to support micro-hydropower plants worldwide.

Poster 20: Haefa Mansour
“Adhesive Elastomeric Proteins”

This project focuses on the development and characterization of a recombinant protein that functions as a surgical adhesive. Surgical adhesives provide a promising alternative to the stiff sutures and staples that often result in external tissue damage when used to close wounds. Ideal surgical adhesives are biocom-

patible, able to set well and remain sticky in moist conditions, possess strong adhesive and cohesive properties, and exhibit mechanical properties that mimic those of the surrounding tissue. Unfortunately, the commercial adhesives available today are unable to meet all of these criteria.

We created a modular protein that combines the adhesive properties of mussel proteins, which are able to strongly adhere to nearly any surface, with the mechanical properties of elastin, a protein that provides flexibility to soft tissues in the body. Thus far, our recombinant protein was successfully cloned into *E. coli* and overexpressed in a 10 L fermentor. The protein was then purified using immobilized metal affinity chromatography, and the pre-adhesive region of the protein was enzymatically converted to impart adhesive properties.

We were able to use crosslinking chemistry to form hydrogels from a model protein and show that the gelation time and mechanical properties can be tuned by altering the crosslinker concentration and pH. The mechanical properties of protein hydrogels are being characterized using controlled-force tensile testing. Our preliminary results demonstrate that our model protein has a Young's modulus that is similar to that of soft tissues and may be of interest in surgical applications.

Poster 21: Benjamin Helfrecht

“Rheological Investigation of Thermoreversible Chocolate”

Often taken for granted by consumers, rheology is a central area of study within the food industry. Understanding the mechanical behavior of various ingredients and existing food products allows for the development of processing and manufacturing techniques to improve characteristics such as shelf life, stability, and mouthfeel. In an effort to supplement the existing body of literature in this field, the rheological properties of Smucker's Magic Shell ice cream topping were explored to gain an understanding of how time, temperature, impurities, and deformation rates affect the material. Temperature-dependent oscillatory tests showed that the Magic Shell was thermoreversible and that an increase in the cooling rate of the material from 0.5 °C min to 2 °C min led to a 6 °C

depression in the solidification temperature. The time required for the material to solidify was also demonstrated to increase with increasing temperature. Furthermore, controlled shear rate measurements produce Newtonian behavior in the material at 35 °C but non-Newtonian, shear-thickening behavior at 15 °C. These results could be used to produce predictive models useful in tailoring similar substances to show desirable behavior under a given set of environmental conditions.

Poster 22: Jaycey Hardenstein

“Optimization of Pretreatment Steps Applied to a Microfiltration System for Rapid Pathogen Detection”

With a growing number of consumers in the American market and with food production at an all-time high, food safety is a huge priority for both consumers and corporations everywhere. Recently, the Laboratory of Renewable Resources Engineering (LORRE) at Purdue University developed a Continuous Cell Concentration Device (C3D) that has the potential to reduce the time required to detect food pathogens. In LORRE's research, food samples are subjected to enzyme pretreatment and pre-filtration to prevent protein aggregation and the subsequent plugging of hollow fiber membranes used in the C3D microfiltration process. Pretreated food samples can then be run through the C3D to recover a concentrated cell solution. Our research investigates the role of pre-filter materials and enzymes to enable microfiltration and ensure recovery of non-pathogenic *Escherichia coli*. The ideal pre-filter material would allow for a large cell recovery while also removing enough particles so that the sample will not plug the C3D. It was determined that the most effective pre-filter material for turkey extract samples was the Advantec 101 filter paper. Through quantifying the reduction of *E. coli* colonies, the Advantec 101 filter paper recovered 80-90% of cells. On the other hand, the GF D filter currently used in the pre-filtration process resulted in only 40-60% cell recovery. In addition, experiments are currently being conducted to discover how enzyme pretreatment affects characteristics of ground beef extract solutions, such as: pre-filtration speed, cell concentration time, and *E. coli* recovery. Ultimately, this research begins to address the critical need for rapid pathogen detection.

Poster 23: Manuel Gutierrez

“Energy Harvesting from Human Motion for Powering of Wearable Electronics”

While wearable electronics have proliferated the industry over the last several years, battery life still remains a limiting factor for the growth of technology. The ability to harvest energy from the kinetic motion of a person could, in theory, provide appreciable power for the worn electronics. Currently, vibration-based energy-harvesting devices are typically limited to being able to harvest motion largely along one direction only, leading to greatly limited to no power output in tilted orientations. Presented is the design, modeling, fabrication, and testing of an electromagnetic vibration energy harvester that generates power based off movements in two dimensions. The device has a magnetically levitated center magnet that freely moves due to external vibration. The magnet's motion is converted to electric power using a coil. The device was created through a series of prototypes. Analytical equations for magnetic flux and force on the center magnet were used in modeling in order to validate each prototype, and determine how it could be further optimized. The current prototype generates a maximum $121\frac{1}{4}W$ to a 330Ω load when the device is subjected to an optimum 7.6Hz vibration of maximum acceleration 0.2g.

Poster 24: Anna Filley

“Can controlled release minimize the foreign body response of neural tissue to electrode implantation? An exploration of multiple neat coats.”

Chronic micro-stimulation of intracortical electrodes has great potential to restore lost function to those living with neurological disease or injury. However, the long-term effectiveness of current devices in vivo is severely limited by the foreign body response (FBR) of neural tissue, in which a glial scar forms around the device, preventing signal transmission between the device and neighboring neurons. This glial scar is linked to increased impedance and reduced signal to noise ratio of the device, which progressively decreases its effectiveness and

prevents functional therapeutic use in the human model. Our research aims to attenuate this FBR without adversely affecting electrode performance through the controlled release of an immune-modulating substance from the electrode.

A thin coating of polymerized tetramethyl orthosilicate (TMOS) is used as the delivery medium for the gradual release of model protein from a wafer platform. To determine the optimal conditions for a controlled, gradual release, we analyzed different coating schemes, building on previous research that had demonstrated the ability of a polymer-only coating to manipulate the protein release profile. Spectrophotometry was used to quantify the release of protein from the wafer into solution over time. Results of this work will help increase understanding of controlled drug release and help improve our ability to modulate the FBR of neural tissue.

Poster 25: Christopher Barney

“Characterization of Dynamic Behavior in Cementitious Systems Through the Employment of a Soft Materials Framework”

Cement has large application as a structural material because it can flow and be molded before setting into a final product with mechanical properties similar to stone. Studying cement as a soft material system has the potential to improve mechanical behavior. Over the past year, experiments have investigated the effect of limestone filler on cement paste flow, the interaction of superabsorbent polymers (SAPs) with multivalent ions, and the effect of confinement on phase change materials (PCMs). Limestone is used as inert filler in cement blends because it reduces the carbon footprint.

This study used oscillatory shear to measure the response of cement paste blended with limestone filler during setting. Blending cement particles with limestone increased shrinkage and accelerated setting time. SAP particles have the potential to control the internal curing of concrete by regulating the absorption and release of fluid in a cement system. Swelling studies showed that interaction of SAPs with Al^{3+} ions present in cement paste formed a network of rigid, cross-linked polymer.

The elastic modulus of this barrier was found to be in the MPa range as compared to the typical KPa range for hydrogels. PCMs are used as deicing agents on pavement and runways. As pavement ages, prolonged reaction of cement causes densification and reduces pore size. Smaller pore sizes have been shown to have a confinement effect, which reduces the amount of heat a polymer will release upon freezing. This study aims to use differential scanning calorimetry to demonstrate a link between confinement and PCMs.

Health and Human Sciences

Poster 26: Anna Winchester

“Effects of a developmental atrazine exposure on CYP17A1 expression”

Atrazine is a widely and extensively used agricultural herbicide, especially in the Midwestern United States. Although the Environmental Protection Agency has set the Maximum Contaminant Level (MCL) to 3 parts per billion in drinking water, it is suspected that even these levels can have adverse health effects. Atrazine is a suspected endocrine disruptor. Endocrine disrupting chemicals can change endocrine function and cause adverse affects at the level of the individual organism itself, its progeny, and subpopulations of the organism.

In the ongoing atrazine study in Dr. Freeman’s laboratory, transcriptomic analysis revealed expression alterations in genes associated with neuroendocrine and reproductive system development, function, and disease; cell cycle regulation; and carcinogenesis following a developmental atrazine exposure at 0.3, 3, or 30 ppb throughout embryogenesis in the zebra fish model system (1-72 hours post fertilization). One of the genes that was shown to be differentially expressed after atrazine exposure was CYP17A1. This gene encodes a number of the cytochrome P450 enzymes and catalyzes reactions involved in drug metabolism and synthesis of cholesterol, steroids, and other lipids.

The goal of this project is to first characterize the expression of CYP17A1 throughout embryonic development of the zebra fish using in situ hybridization and quantitative PCR (qPCR) to compare location and level of expression at different embryonic stages. In addition, the location and quantitative level of CYP17A1 gene expression after atrazine exposure is being defined using in situ hybridization and qPCR throughout embryonic development.

Poster 27: Claire Tighe

“Detection and Control of Pathogens in University Computer Centers”

Purpose: The main goal is to test Purdue University Computing Center keyboards for pathogens through the use of culturing techniques and BARDOT (Bacterial Rapid Detection using Optical Scattering Technology) laser analysis, as well as an implemented sanitation program.

Methods: Ten computer labs on Purdue University’s campus have been selected for sampling. Five computers from each of the ten selected labs will be swabbed for bacteria; there will also be a control swab (swab exposed to air) for each lab. These swabs will be enriched in Tryptic Soy Broth (TSB) and then plated for growth on to five different types of agar to select for the presence of different bacteria. These bacteria include, but are not limited to, staphylococcus aureus, pseudomonas aeruginosa, Bacillus Cereus, coliforms, and Gram-negative bacteria entericbacteria. This will give a total of three hundred fifty plates that will then be identified through the use of the BARDOT system.

Results: Results are to be determined as swabbing and culturing is in progress. It is highly expected to find staphylococcus due to the natural human flora and coliforms due to lack of student hygiene.

Conclusion: If results turn out as hypothesized, the need for proper sanitation of university keyboards will be displayed, as well as the confirmation of the keyboard as a reservoir for bacteria. From that point, proper sanitation methods will be evaluated, and the university will be encouraged to implement

sanitation in order to prevent the transmission of bacteria and illnesses among students and promote student health.

Poster 28: Kelly Schlotman

“Deregulation of miRNA-126 expression in developing zebrafish exposed to the herbicide atrazine”

Atrazine is a commonly used herbicide in the United States that is reported to contaminate drinking water sources. Studies indicate atrazine to adversely impact the neuroendocrine and reproductive systems and to be a potential carcinogen. The current maximum contaminant level for atrazine in drinking water is 3 parts per billion (ppb); however, levels higher than 3 ppb are often reported. Ongoing studies in our laboratory are investigating the immediate and latent adverse health outcomes associated with a developmental atrazine exposure and identifying the genetic and epigenetic mechanisms of atrazine toxicity using the zebra fish model system.

MicroRNAs (miRNAs) are epigenetic regulators that post-transcriptionally control the translation of mRNA. Expression of miR-126, a miRNA associated with angiogenesis and tumorigenesis, was identified in a microarray study to robustly change in zebra fish embryos exposed to 0.3, 3, or 30 ppb atrazine through the end of embryonic development [72 hours post fertilization (hpf)]. To further investigate the developmental expression of miR-126 in zebra fish, quantitative PCR (qPCR) was used to profile expression throughout embryogenesis in control conditions at 12, 24, 36, 48, 60, and 72 hpf.

Expression of miR-126 was developmental time point specific with peaks in expression at 36, 60, and 72 hpf. The possible deregulation of miRNA-126 throughout embryonic development by atrazine is now being tested using qPCR. Zebrafish embryos exposed to 0.3, 3, or 30 ppb atrazine are being compared to a control treatment at all six developmental time points to provide a greater understanding of an epigenetic mechanism of atrazine toxicity.

Poster 29: Geoffrey Ryan

“Expression of glyoxylase 1 (glo1) throughout zebrafish embryonic development and alterations following atrazine exposure”

Atrazine, a commonly used herbicide in the Midwest, is an endocrine disruptor and a suspected carcinogen. Although atrazine is banned by the European Union, the United States has a current maximum contaminant level (MCL) of 3 ppb in drinking water. The health risks associated with this MCL are currently being reviewed by the Environmental Protection Agency; however, the mechanisms of atrazine toxicity are not well defined. In this study transcriptomics was first used to identify genes with altered expression following exposure to 0, 0.3, 3, or 30 ppb atrazine during embryogenesis with the zebra fish model system. This analysis showed that expression alterations were enriched with genes associated with neuroendocrine development and function, cell cycle regulation, and carcinogenesis.

From this list of genes, glyoxylase 1 (glo1) was targeted for further study. glo1 is part of the glyoxylase system that converts methylglyoxal to S-D-lactoylglutathione. Upregulation of glo1 is linked to cell proliferation and is associated with various cancers in humans. To further our understanding of this genetic target, expression was analyzed at five developmental time points (24, 36, 48, 60, and 72 hpf) after exposure to 0, 0.3, 3, or 30 ppb atrazine under normal conditions. glo1 was found to be ubiquitously expressed at each time point with most of the staining concentrated in the brain and liver. Quantitative PCR (qPCR) is also being applied to determine gene expression levels of glo1 throughout development. This data is furthering our understanding of glo1 expression during development and alterations induced by embryonic atrazine exposure.

Poster 30: Jenna Ramsey

“The Effect of Intraoral Suction on Oxygen-Enriched Surgical Environments: A Method for Reducing the Risk of Surgical Fires to Patients and Surgeons?”

The Effect of Intraoral Suction on Oxygen-Enriched Surgical Environments:

A Method for Reducing the Risk of Surgical Fires to Patients and Surgeons?

Objectives: To determine: 1. conditions required for a simulated intraoral dental surgical fire to develop after activation of a standard monopolar electrocautery unit. 2. the effect of suction on the onset and duration of combustion. 3. if suction is a useful method for reducing the risk of surgical fires.

Methods: A gutted, whole raw chicken was used as the oral cavity analog where 100% O₂ concentration was delivered through the neck portion of the chicken using nasal cannula tubing at 6 L min. Suction for the O₂ was set at 10' of Hg. For each trial, two pieces of surgical gauze were placed inside the chicken while an electrocautery unit with a common dental surgical suction tip was used to simulate oral surgery inside the cavity. A verbal signal from the operator was given when 'pop,' 'flare,' or 'flame' was heard or seen. Each chicken was used for 5 separate trials.

Conclusion: Twenty trials without suction and 20 trials with suction were analyzed. T-test analysis was performed resulting in a significance level of $p < 0.01$ between the two conditions, showing that the incidence of fires without suction (75% resulting in a pop, flare, or flame) is significantly greater than the incidence of fires with suction (15%). Therefore, in order to minimize the risk of fire associated with oral surgical procedures, it is recommended that suction and electrocautery be used simultaneously.

Poster 31: David Putt

“Patient recovery needs and nurse best practices using a new scavenging system to control waste anesthetic gases in the Post Anesthetic Care Unit (PACU) - a Case Study”

Objectives: Waste anesthetic gas (WAG) exposure in the PACU is a recent discovery revealed by advances in infrared videography technology visualizing patients off-gassing WAGs. A scavenging system was developed to decrease the WAG exposure in PACUs. This pilot study evaluated exposure to nurses and potentially patients, as well as the effectiveness of this new system to control WAGs in the PACU.

Methods: Observations that were recorded at Community Health, Indianapolis, on the mask use of five patients in the PACU included the time of mask administration and if the mask was removed while in use. A survey was administered to PACU staff to understand the demographics of the working population and analyze symptoms changes detected by the staff after the new system's use.

Results: Average patient time in the PACU was one hour with approximately half of that time with the mask on. The mask was removed an average of three times. Survey results (n=14) showed that the employees were females with healthcare experience of at least ten years and ranged in age from thirty-one to sixty. The majority interacted with six to ten patients day receiving anesthetic gas. Before the scavenging system, seven employees reported 'yes' or 'not sure' to having symptoms (headaches, fatigue, fertility problems, miscarriages). Following the initiation of the scavenging system's use, four of the seven reported a decrease in symptoms.

Conclusions: According to the results, this system may have decreased symptoms for more than half of the employees that reported them prior to its setup.

Poster 32: Whitney Popp

“Ergonomic Evaluation of Daily Agricultural Work Practices on a Family Farm”

Objectives: 1. To analyze daily agricultural work practices on a family farm from an ergonomic perspective and determine work risk factors associated with these practices. 2. To use standardized ergonomic tools to analyze work practices using the semi-quantitative method of Rapid Entire Body Assessment (REBA). 3. To provide general redesign recommendations to make the work practices safer.

Methods: General analyses of several daily agricultural activities were performed and photographed to capture activities that could contribute to the development of musculoskeletal disorders. REBA was used on example jobs to semi-quantify work risk factors. General re-design recommendations were

given to improve each observed work activity.

Results: Each individual work activity was analyzed. The semi-qualitative analyses from REBA provided insight into awkward body postures and positions that caused strain on the back. This resulted in general redesign recommendations to make work practices more ergonomically sound. The REBA Evaluations provided high scores, indicating a very high risk and recommend immediate change to the performance of the activity.

Conclusions: Evaluating agricultural jobs from an ergonomics perspective and using REBA helped prioritize the most stressful jobs and focused attention on those jobs at highest risk for musculoskeletal disorders and injuries. From this approach, we were able to re-evaluate and re-design the way that daily agricultural activities are performed. This could help farmers decrease musculoskeletal strain on their bodies. In turn, this could decrease musculoskeletal disorders related to farming practices. With simple work practice changes, musculoskeletal disorders and pain could be reduced and lead to a better quality of life for farmers.

Poster 33: Macaela Parker

“Toddler Language Skills Agreement between Parent Questionnaires and Examiner Observations”

Parent-report questionnaires are utilized to collect a variety of information. By using these questionnaires in conjunction with examiner reported tests, a clear overview of a child’s developmental progress can be tracked. Even though using these questionnaires may yield a great deal of critical insight in to child development in early life, it is unclear if parents and examiners consistently capture the same developmental progress.

This study investigated the correlations between parent and examiner reports in 18 month old children by comparing examiner observations and parent-reports in receptive and expressive language. Data from 25 families were utilized for this exploratory study. The examiners observed and scored child receptive

and expressive language using the Mullen Scales of Early Learning and parents answered a series of questions about their child's receptive and expressive language on the Vineland Adaptive Behavior Questionnaire.

Examiner and parent scores were converted into age-equivalent scores to provide comparable scaling. Using bivariate correlations our results indicate that parents and examiners are capturing comparable developmental progress. However, because this exploratory analysis includes a relatively small sample and only one age group, further research of additional age groups are being explored.

Poster 34: Isha Kaul

“Neurogenetic Effects of Low-Dose Ionizing Radiation”

The goal of this project is to determine short- and long-term adverse health effects of low-dose ionizing radiation on the central nervous system. Based on a preliminary study showing radiation-induced changes in the expression of two glutamate receptor genes, the genes *gria1a*, *gria1b*, *gria2a*, *gria2b*, *gria3a*, *gria3b*, *gria4a*, and *gria4b* were targeted in our zebra fish model. Glutamate receptors are associated with cognitive functions such as learning and memory. The zebra fish were bred and the larval zebra fish dosed with Cobalt-60 gamma irradiation at five days post-fertilization (dpf), at four dose levels: 0 Gy, 0.11 Gy, 1.0 Gy, and 2.0 Gy. Tissue samples were collected from the fish's full-body tissue at 6 dpf (24 hours after irradiation), and brain tissue at 4-months post-fertilization (mpf), 8 mpf, and 12 mpf. RNA was isolated from the tissues, cDNA synthesized, and the samples analyzed via quantitative PCR (qPCR). Examining the qPCR data of 6 dpf gene expression revealed no significant changes in the expression of any of the eight listed genes. We conclude that at one day post-exposure, ionizing radiation has no significant effect on the expression of the eight glutamate-receptor genes. Collection and analysis of 4 mpf, 8 mpf, and 12 mpf is currently in process.

Poster 35: Thomas Freije

“Effect of Co-Ligands on Chemical and Biological Properties of

$^{99m}\text{Tc(III)}$ Complexes [$^{99m}\text{Tc(L)(CDO)(CDOH)2BMe}$] (L = Cl, F, SCN and N3; CDOH = Cyclohexanedione Dioxime)”

Myocardial perfusion imaging (MPI) with radiotracers is an integral component in evaluation of patients with known or suspected coronary artery disease (CAD). ^{99m}Tc -Teboroxime ($^{99m}\text{TcCl(CDO)(CDOH)2BMe}$) (^{99m}Tc -Teboroxime) is an FDA-approved radiotracer with a high heart uptake. However, ^{99m}Tc -Teboroxime washes out of the heart quickly, and researchers are looking to develop more efficacious radiotracers. This study aims to determine if adding specific co-ligands to $^{99m}\text{Tc(III)}$ complexes [^{99m}Tc -Teboroxime] has a positive effect on heart uptake and retention time. The co-ligands under investigation in this study are chlorine (Cl), fluorine (F), cyanide (SCN), and azide (N3). These tracers were synthesized by reacting ^{99m}Tc -Teboroxime(L) (L=F, SCN, and N3) with NaF, NaSCN, and NaN₃ respectively. Radio-HPLC was used to characterize all radiotracers, and monitor their solution stability.

Radiochemical purity (RCP) values for ^{99m}Tc -Teboroxime, ^{99m}Tc -Teboroxime(F), ^{99m}Tc -Teboroxime(SCN), and ^{99m}Tc -Teboroxime(N3) were >95%, 85-90%, 90-93%, and >95% respectively. Sprague-Dawley (SD) rats were utilized for biodistribution and planar imaging studies to determine heart uptake and retention for the ^{99m}Tc -Teboroxime(L) (L=F, SCN, and N3) compounds. The fast-phase myocardial retention time follows the general order of ^{99m}Tc -Teboroxime(N3) > ^{99m}Tc -Teboroxime(SCN) > ^{99m}Tc -Teboroxime > ^{99m}Tc -Teboroxime(F). ^{99m}Tc -Teboroxime demonstrated the best first-pass extraction fraction out of the ^{99m}Tc radiotracers evaluated in SD rats. The heart uptake for ^{99m}Tc -Teboroxime(N3) was similar to that of ^{99m}Tc -Teboroxime. It was concluded that the different co-ligands [$^{99m}\text{Tc(L)(CDO)(CDOH)2BMe}$] (L=Cl, F, SCN, and N3) had a significant impact on the heart uptake and myocardial retention. Future studies should be directed towards increasing radiotracer heart uptake and retention time relative to values for ^{99m}Tc -Teboroxime.

Poster 36: Anna Forster

“Nursing Students’ Perception of Adoption”

Adoption is a worldwide practice with the majority of Americans knowing someone who has been adopted, has adopted a child, or has relinquished a child for adoption. Most health care professionals, including nurses, will have contact with patients who have a connection to adoption. This study examined the overall perceptions, current knowledge, and gaps in nursing curriculum as reported by undergraduate nursing students.

Key Words: adoption, nursing, education, perceptions, attitudes, curriculum.

Poster 37: Joseph Fischer

“www.MolecularHUB.org: Development and Evolution of HUB to Monitor, Inform and Educate Scientists about Emerging Diseases at the Molecular Level”

Purpose: 1) To monitor emerging trends in epidemiology and molecular science through a non-commercial and non-promotional world class molecular science and diagnostics Hub that engages scientists, academics researchers, clinicians, healthcare providers, public health, diagnostic experts, government and industry professionals 2) Create network for professionals to easily communicate molecular science knowledge.

Methods: 1) Designed and developed MolecularHUB.org from Purdue’s Hub-Zero.org platform; 2) Developed contact lists of professionals from academia, hospitals clinical, reference laboratories, and public health; 3) Develop techniques to publicize findings and expand the citation database in epidemiology and molecular science; 4) Posted discussion questions allowing members to exchange ideas about current topics; 5) Used MolecularHUB.org for surveillance of the recent polio-like syndrome outbreak in California children. Results: MolecularHUB.org is now considered the ‘one-stop-shop’ for molecular sciences and diagnostics information among researchers globally.

From October 24, 2012 to February 28, 2014, MolecularHUB.org membership expanded from 77 to 711. Citations increased from 30 to 3970. Cumulative web server hits increased from 48,921 to 9,338,964. Hub visitors grew from 199 to

4,227 and visits increased from 430 to 8,766. Available resources (posters, webinars, seminars, journals, etc.) have regularly increased. A new feature is posting of daily news relating to molecular science and public health. The discussion forum questions are promoting interaction between members.

Conclusions: MolecularHUB provides resources that are potentially useful surveillance tools for emerging trends in epidemiology, molecular science and diagnostics. Collaborations through the portal may promote improvements in the prevention, interventions, and diagnoses of various illnesses and other public health concerns.

38: Michelle DeVilbiss

“Detection and Control of Pathogens in University Computer Centers”

Purpose: The main goal is to test Purdue University Computing Center keyboards for pathogens through the use of culturing techniques and BARDOT (Bacterial Rapid Detection using Optical Scattering Technology) laser analysis, as well as an implemented sanitation program.

Methods: Ten computer labs on Purdue University’s campus have been selected for sampling. Five computers from each of the ten selected labs will be swabbed for bacteria, there will also be a control swab (swab exposed to air) for each lab. These swabs will be enriched in Tryptic Soy Broth (TSB) and then plated for growth on to five different types of agar to select for the presence of different bacteria. These bacteria include, but are not limited to, staphylococcus aureus, pseudomonas aeruginosa, Bacillus Cereus, coliforms, and Gram negative bacteria entericbacteria. This will give a total of three hundred fifty plates that will then be identified through the use of the BARDOT system.

Results: Results are to be determined as swabbing and culturing is in progress. It is highly expected to find staphylococcus due to the natural human flora and coliforms due to lack of student hygiene.

Conclusion: If results turn out as hypothesized, the need for proper sanitation of university keyboards will be displayed, as well as the confirmation of the keyboard as a reservoir for bacteria. From that point, proper sanitation methods will be evaluated, and the university will be encouraged to implement sanitation in order to prevent the transmission of bacteria and illnesses among students and promote student health.

Liberal Arts

Poster 39: Caitlin Young

“Corporate Social Responsibility and the Purdue Tuition Hike Protests of 1969”

The rising cost of tuition is a hurdle many face when beginning or contemplating a return to the University and their higher education. However, this is far from simply a recent issue. In 1969 the federal government, and then the state government, announced that Universities would be receiving a reduction in support over the next few years. Purdue University President Fredrick L. Hovde, along with the Board of Trustees of Purdue University responded in March of that year, by approving an increase in tuition at the University, a \$300 per year increase for in-state students and a \$400 dollar increase for out-of-state students. This sparked outrage among students, who promptly organized several peaceful protests which culminated in a public meeting with the administration.

The final result was that the majority of students sided with the administration and tuition increased the following fall. This lack of gain, either of legitimacy and acceptance or in new advantages for the movement itself, classifies it as unsuccessful. What can account for this lack of success? Newsreels, newspaper articles, and meeting minutes from the board of trustees suggest the students attempted to employ strategies which had been successful during the civil rights movement such as live-ins and boycotts. Sociologists such as James Gravelle and Colin Rogers suggest that the business tactics employed during protest policing may account for this difference. President Hovde unwittingly utilized

the tenets of corporate social responsibility to suppress and eliminate protest activity on Purdue's campus in 1969.

Poster 40: Chelsea Spring
“Brand Strength Through Starbucks Social Media”

In a society where countless corporations, organizations, and institutions compete every day for consumer attention, social media has quickly become one of the most crucial tools for forging genuine connections with audiences, and setting desired communication apart from surrounding noise. In order to effectively distinguish one message that we send through social media from the next, however, an understanding of not only how social media works, but what makes social media strategy effective is required. The purpose of this research was to examine the social media tactics of Starbucks, and identify elements of good social media strategy that can help companies build strong brand equity.

This case study was performed through close analysis of various Starbucks social media pages, including Facebook, Twitter, Instagram, YouTube, Pinterest, MyStarbucksIdea, a corporate blog, and the official Starbucks website. Research was also collected through online databases and academic journals to synthesize opinions from the field about what theoretically makes good social media, and how companies can achieve that goal.

The collection of professional delineations and definitions of good social media, in addition to the close analysis of all nine Starbucks social media outlets in relation to brand equity, led to the conclusion that through the implementation of user-focused content, consumer-corporation dialogue, and corporate storytelling, successful social media strategies that build the base for a strong brand equity can be achieved. The research also points towards methods to strengthen the brand equity of Starbucks even further by offering tactics to diversify the Starbucks brand through existing social media.

Poster 41: Kevin Robey
“Rap, Riot, and Rodney King: The 1992 LA Revisted”

Through examination of sources of music history, cultural history, and political history I explain how gangsta rap culture critiques the oppressive LAPD culture in order to contextualize a style of music that many people do not understand. While many scholars and contemporary journalists have condemned gangsta rap for its vulgarity, sexism, and negativity, I examine it as both a cultural source and legitimate form of political activism to show the important connection between the values expressed in gangsta rap and their ultimate fomentation in the form of the LA riots. The thesis of my writing is that Los Angeles gangsta rap served as an extension of the Black Power Movement expressing what the minorities of Los Angeles faced under the authority of the LAPD in conjunction with urban flight during the Reagan Era, and the LA riots served as a concrete manifestation of the ethos of gangsta rap with its call to lash out against the abuses of white authority and strive for community control and economic empowerment.

Poster 42: Samantha Richards

“The Namibian Genocide and Great Britain’s Fight for Colonial Hegemony in Africa”

In 1884 Germany colonized Southwest Africa, presently known as Namibia, in an exercise of transcontinental imperialism. During their colonial reign, Germans committed numerous atrocities and human rights violations of the indigenous populations of the region. The result is known today as the ‘Namibian Genocide,’ which marginalized and murdered the Herero and Nama communities. Between 1904 and 1907, German soldiers carried out General Luthar von Trotha’s Vernichtungsbefehl , or extermination order and engaged in a violent war to solidify their governing power over Southwest Africa.

After World War I, Germany had lost the war along with much of its imperial power abroad while Great Britain continued to validate its strength as a great colonizer and sought to acquire German Southwest Africa. In 1918, the British government published a Blue Book which outlined the terrors of the Namibian Genocide through both German and African eyewitness accounts. The 1918

Blue Book titled, Report on the Natives of South-West Africa and Their Treatment by Germany, claimed that the British desired acquisition of the colony based on purely humanitarian principles.

In response to the 1918 Blue Book, Germany published a 1919 White Book that countered the ‘~outrageous’ claims made by the British government. This paper will examine both the 1918 Blue Book and the 1919 White Book and argue that British motivations for acquiring German Southwest Africa were not rooted in morality, but instead by their ravenous appetite for natural resources and increasing control of the continent.

Poster 43: Tyler Pitts

“Conformity and Individuality: Female Circumcision and Genital Piercing”

Female genital mutilation, better known as female circumcision, has been a highly debated topic among modern day feminists. To Westerners, it is seen as a violation of women’s sexual and reproductive rights and as a violent form of male domination over females.

Although feminists are fighting for a good cause, it is often overlooked that many African women, though living in a patriarchal society, choose themselves to be circumcised. Just as Westerners have milestones to reach in our own lives, female circumcision is a milestone for African women and even some men. It is a rite of passage and women who are circumcised see themselves as only upholding tradition.

But, what we as Westerners have to realize is that there is more than one form of circumcision and we, in fact, do practice one of those forms here in America: genital piercing. It is becoming one of the more popular forms of body modification among young adults, both male and female. While Types I, II, and III of circumcision are the more extreme procedures, Type IV is simply any other ‘piercing, pricking, incising, and stretching of the clitoris and or labia’ (Jones, Diop, Askew, and Kabor © 1999: 219). Genital piercing falls under this catego-

ry. It may not be as violent as it is portrayed to be in Africa, but just about the only difference between female circumcision and genital piercing is that one culture sees it as a necessity while the other views it as a privilege.

Poster 44: Bradley Pierson

“Nixon’s Israel: Pillars, Proxies, and the 1970 Black September Crisis”

The civil war in Jordan during September 1970, an event known as Black September, is among the most understudied Cold-War episodes in long history of the Arab-Israeli dispute. Though Black September has received a considerable amount of scholarly attention in recent years, much of the existing historiography focuses solely on the conflict’s impact on Mid-East geopolitics rather than on America’s policies toward its friends. Through the lens of memoirs, government publications, and recently declassified documents held in the Richard M. Nixon Presidential Library, this essay examines the diplomatic relationship between the U.S. and Israel between January 1969 and December 1971.

Black September marked a turning point for U.S.-Israeli relations. Israel’s tough, uncompromising approach to Mid-East affairs during the first twenty months of Richard Nixon’s presidency caused an intense cooling of relations between Washington and Tel Aviv. The hijacking of four commercial aircraft on September 6, 1970 and a subsequent Syrian invasion of Jordan, Israel’s neighbor, on September 20, however, changed that. Israel’s tough, like-minded approach to the crisis demonstrated to the Nixon administration its capacity to operate as an effective U.S. proxy. The crisis’s resolution on September 22, 1970 marks the point where the Nixon administration began to view Israel more as a strategic asset than it did a diplomatic liability.

Poster 45: Dillon Mills

“Hokusai, Japanese Folklore, and Modern American Horror”

Superstition and fantasy are characteristics of human nature older than recorded history, but throughout antiquity evidence of peoples’ outlandish beliefs, twisted legends, and creatures of the subconscious can be found in

art, literature, and religion. Forward thinkers and creative artists residing in geographically isolated Japan were able to produce work without the taint of the boisterous West and develop the stories of their ancestors. The master painter and print maker Katsushika Hokusai was one of the many individuals who put Japan's culture to record, and did so as a visionary with a particular interest on the occult.

Hokusai's *The Ghost Oiwa and the Buddhist Monk YÅ«ten* (Fig. 1) is a sketch from the 10th volume of *Hokusai Manga* (1815-1819), a collection of drawings, prints, and paintings. Though just an entry in the artist's sketchbook, it represents a culture teeming with unique stories and beliefs. Understanding the obscure nature of common stories in Japanese folklore, theater, and spirituality is necessary to appreciate the subject matter of many Hokusai prints.

The ghoul portrayed in the illustration is one of many creative and unusual characters from a throng of original stories in Eastern folklore. In a world culture supported by technology and driven by globalization, stories from Japanese antiquity are found unaccredited throughout modern, western society. After introducing the superstitious artist Hokusai, analyses on a selection of his works will reveal the intriguing and gruesome stories that inspired directors of today to write American media motivated by Japan's outstanding horror culture.

Poster 46: Katie Martin

“Indiana and the CCC: Race Relations, Representation, and Company 517”

With Indiana's bicentennial fast-approaching, Hoosiers are focusing on their own fascinating history. The Civilian Conservation Corps was one of the most popular New Deal relief agencies and aided over three million young men across the country from 1933 “ 1942. In Indiana, enrollees in 57 camps across the state were paid to fight fires, create hiking trails, plant trees, and build recreational buildings in state parks and state forests.

The CCC was created with the intent of employing young men, regardless of race, but historians do not consider the national CCC successful in improving race relations. CCC Company 517 was one of eight African American companies in Indiana and was stationed in Corydon, South Bend, and Portland. Company 517 was one of the longest serving companies in the nation. My research examines how Company 517 dealt with racial issues in urban and rural settings, studies the extent to which people of color were left out of CCC promotional imagery, and compares the national and local goals of the CCC in terms of race relations.

To research Company 517, I read through camp newsletters which were published by the camp's journalism class from 1933-1941. I also utilized online databases, scholarly works on the New Deal in Indiana, and the CCC collections from the Indiana Historical Society. My project tells the story of Company 517 and race relations in Indiana during the 1930s.

Poster 47: Michael Lockman

“Congenital Deformity in Mesoamerican Pre-History: A Model of Accommodation”

Research investigated pre-Columbian Maya socioeconomic practices regarding individuals with congenital deformity. Care was defined and delineated into both direct support and accommodation of pathology as identified via clinical diagnostic criterion in modern medical literature. Quadripartite analysis of pathology and accommodation adapted from relevant literature, and further review of classic Graeco-Roman and Egyptian archaeology, provided a framework through which subsequent findings were analyzed and ultimately dichotomized on a continuum of demonization and deification. It was determined that reproductive customs directly influenced incidence of physical deformity, also mediated by environmental factors, which in turn enacted upon social norms through the lens of collective knowledge; social norms in turn shared a synergistic relationship with reproductive customs, mediated by institutional regulation.

Poster 48: Eden Holmes

“A Tale of Two Satterfields: The Power of a Purdue Education”

At the turn of the 20th century, one’s original positioning on the socioeconomic strata played a gigantic role in one’s capabilities to achieve professionally. Academic engagement was often a prerequisite to jump rungs on the class ladder and achieve positive social mobility, and the development of land-grant colleges such as Purdue University facilitated such forward accomplishment. To measure the exact impact of a Purdue degree on upward social development, I utilized an adept case study technique. I examined the lives of two working-class young men who possessed almost identical characteristics, including hometown, familial background, initial academic aptitude, personality, and even name, except for the point of study – one graduated from Purdue, while the other did not aspire to higher education.

Each individual aspired to achieve higher social positioning and fought to shatter the class ceiling for their entire professional lives, but the path of the former Boilermaker was exponentially smoothed due to his academic certification. Although each man faced crippling harassment, mockery, and even utter rejection due to their working-class upbringings, the capability to build a higher social platform and provide extended options for one’s family was extended to the Purdue graduate.

Although the basis for this study relies on historical context, the sociological implications of a lifetime case study demonstrate an equal consensus for modern application. Academic pursuit remains the dominant route for the achievement of a higher socioeconomic status for persons seeking to escape the boundaries of the working class.

Poster 49: Alexandra Hoff

“Charles Johnson’s “Middle Passage” as a Slave Narrative”

In his novel, *Middle Passage*, Charles Johnson deviates from the classic slave narrative tradition by depicting the journey a newly freed man embarks upon

that brings him face to face with the Middle Passage, and by questioning whether or not this character shows tremendous growth after such a trip, which is typically an important aspect in traditional slave narratives. In this sense, several questions and issues must be examined.

First, it is important to determine in what sense Johnson's Middle Passage is a slave narrative, what characteristics it has as one, and what is contrary to the typical slave narrative. Second, through Middle Passage, Johnson suggests that history can be fictionalized, therefore eliminating the truth of the story and battling with story-truth and happening-truth. It is interesting to explore how the reader can separate fact from fiction in this regard and ponder whether or not the fact that the novel works backwards helps the reader to better understand the fictional story apart from any truth it conveys. Third, compared to other slave narratives, such as those of Frederick Douglass and Harriet Jacobs, Johnson's novel appears to be unique as a slave narrative, if one at all, given the philosophical elements of the story, and finally, the demonstrative value and importance of fiction and the written word.

How this is demonstrated, particularly in light of Johnson's own perspective, and the potential for fiction to liberate will be explored in light of the way in which Johnson's narrative, and perhaps others, examines identity.

Poster 50: Madison Heslop

“Charlie Chaplin Eats a Shoe: The Klondike Gold Rush in Popular Culture”

The recent Discovery Channel miniseries 'Klondike' chronicles the story of a man who travels to the Klondike in search for gold and becomes tangled up in much more than he bargained. The miniseries is yet another installment in a century-old tradition of fictionalized Klondike Gold Rush accounts, yet there is no existing scholarship on portrayals of this historic episode in popular culture.

My paper addresses the Klondike Gold Rush as imagined and portrayed in popular culture from the early twentieth century through the present day, paying

special attention to how these portrayals have changed over time and across diverse media. I argue that depictions of the Klondike Gold Rush in popular culture have demonstrated consistent traits and attitudes that differentiate portraits of this historic episode from other representations of the Old West.

This project, by examining the Klondike Gold Rush in various forms of popular culture over time, opens up an unmined cache in both cultural and transnational history.

Poster 51: Selina Hammond

“The Poor as ‘Other’: Engaging with the Poor through Art”

This paper shows that depictions of the poor “homeless, slaves, and the lower class” have developed from documentation of ‘the other’ into a connection with ‘the other.’ This topic raises important issues in the social sphere: presenting artwork of the poor could be seen as just propaganda for social change; the viewer may also become more self-centered in the process of connecting and identifying with the poor; and the poor may not still gain a voice in the political and social discussion involving their own circumstances.

By delving into the process of depicting the poor throughout art history, modern society can recognize the progress and future of political and social issues concerning the poor. The paper utilizes five different periods “including artists such as Ettore Cercone, Courbet, van Gogh, Walker Evans, and Lee Jeffries” to gain insight into the development of contemporary depictions of the poor.

Artworks from each artist are analyzed according to the relationships between society and ‘the other,’ beginning with the shift of artwork from the Eastern ‘other’ to the Western ‘other.’ Results conclude that the next step for the poor’s social and political movement must be action rather than reflexive empathy, if Lee Jeffries is the climax of engaging the viewer with ‘the other.’

Keywords: art history, poor, homeless, social justice, the other, empathy

Poster 52: Jonathan Goodwin
“Building a Stronger Libya: Democracy and State”

After ousting Colonel Moammar Gadhafi from control, the Libyan rebels operated a transitional government and held their first free elections in June 2012, establishing the General National Congress to draft a constitution. Since that time, the GNC has failed their key responsibility and roving militias exert their wills across the country unchecked, leaving the young democracy in a state of illegitimacy and crisis. Establishing the severity of the dangers imperiling Libya with Banks’s weighted conflict index, various institutional democratic patterns were evaluated for their effects on violence and populations.

Applying the different frameworks to the Libyan case, it was concluded the Arend Lijphart’s model of consociational democracy would best address a majority of the violence and other assorted problems facing Libya. Instituting power-sharing and consensual measures into their new constitution, the GNC can construct a solid government, one that can ameliorate the issues in the country and not only survive, but prosper into a new age for Libya.

Poster 53: Melissa Gokmogol
“Cleaner Air Beyond California”

In 1984, California introduced the California Smog Check program, leading to a remarkable reduction in smog within a few years. This program was the latest in a number of programs that had been introduced since the 1940s to deal with air pollution in California. One of the goals of the Smog Check program was to reduce the levels of ozone, a gas produced by fossil-fuel emissions reacting with sunlight.

The presence of ozone and high levels of CO₂ has been linked to various types of cardio-vascular and pulmonary diseases. As of 2011, only 15 other states, not including Indiana, had adopted similar legislation. Now the EPA is developing a policy to establish emission standards on a national level. Support has come from the automotive industry and from environmental and health

groups, but petro-chemical groups say such standards would be burdensome and without merit. Both the Obama administration and the American Lung Association have pointed to lower health costs and increased productivity as potential outcomes of such a policy.

Poster 54: Abigail Godollei

“Howard Zinn, Mitch Daniels, and Political Process Theory”

On Tuesday, November 5, 2013, over 100 people gathered at Purdue to participate in the Howard Zinn Read-In to protest censorship and promote academic freedom. The Read-In was held in response to the recent Associated Press discovery of emails sent by Mitch Daniels, then the Governor of Indiana and currently the President of Purdue University, calling for a ban of Zinn’s works in Indiana classrooms.

This research focuses on the emergence of the protest through the lens of the political process theory of protest emergence. The political process theory has four components: protest is a result of a process that unfolds over time; organization, political opportunity, and cognitive liberation are necessary; protest is political, rational, and organized; participants generate their own resources. All components of the political process theory were present in the case of the Howard Zinn Read-In. Based on the data collected, it can be concluded that the political process theory explains the emergence of the Howard Zinn Read-In.

Poster 55: Kelsey Campbell

“Captain America’s War-Demographic Propaganda in World War II”

Propaganda during World War II took many different forms as it was aimed at different age demographics. For children, comic book heroes like Captain America were the primary means of transmitting information about the war and what children could do to help, while for adults, the better-known posters and informational video shorts were more popular. After analyzing samples of both types of propaganda, the research shows that the content of each branch is virtually the same, with only the medium and intensity of the information

altered for each audience.

Science

Poster 56: Connor Rohan

“Source and Credibility: Beginning and Advanced Engineering Students’ Perceptions on Information Search Strategies”

This study examines how engineering students approach finding and using information as they solve their engineering projects. The investigators conducted 21 semi-structured interviews with engineering students representing a variety of majors, class standing, gender, and ethnicities. Interviews were open-coded to discover emergent themes and categories of information strategies. The upper level engineering students discussed several more techniques which aid them in finding and applying sources compared to lower level engineering students.

The analysis resulted in two distinct differences between lower level and upper level students: (1) Lower level engineering students discuss searching broadly, whereas more advanced students discuss going to professional associations and technical sites. (2) Lower level students discuss using visual aspects to judge credibility, whereas more advanced students use their own subject matter knowledge as well. Results show that as engineering students’ progress through their education, they are able to use broader and more complex searching strategies to assist in finding information to complete their projects.

First year curriculum designed to teach first year students these techniques may improve their ability to begin the search process. It is important to show students examples of when information online is not found to be credible, in order to highlight their need to evaluate.

Poster 57: Kristin Zabrecky

“Age-related changes in GAD 65/67 expressing neurons in the dorsal lateral lemniscus”

Presbycusis, or age-related hearing loss, can result in the decreased ability to process sound. Inhibition in the ascending auditory pathway of the brain decreases with age and is important in sound processing. The lateral lemniscus (LL) forms major inhibitory projections that are critical for shaping auditory selectivity, especially in the inferior colliculus (IC). Previous studies have shown a decrease in inhibitory neurons in the IC with age; however, the cause of this decrease is currently unknown.

This study explored protein levels and neuron counts of GAD 65/67, an enzyme that synthesizes the main inhibitory neurotransmitter gamma-aminobutyric acid (GABA), of young and aged rats in the dorsal LL. It was hypothesized these regions would exhibit quantitative and qualitative differences between the age groups. Brain coronal sections of 6 Fisher 344 rats, 3 from each age group, were immunostained for NeuN and GAD 65/67 proteins and photographed with confocal microscopy. NeuN stained cell bodies also expressing GAD 65/67 were quantified using Image J software.

The preliminary data analysis of neuron counts showed little differences between the animals, but more analysis is needed to look for differences in GAD 65/67 expression. These results suggest that age-related changes in sound processing may not be the result of changes in GABAergic neuron counts in the lateral lemniscus.

Poster 58: Erica Wimer

“The Role of ROS in Neuronal Motility”

At high concentrations, Reactive Oxygen Species (ROS) are known for causing oxidative damage that greatly interferes with cellular function and ultimately results in cell death. These toxic effects are due to the oxidation of lipids, proteins and DNA and are well documented in cancer, diabetes and neurodegenerative disorders including Alzheimer's and Parkinson's disease.

However, physiological levels of ROS are shown to play an important signaling role in mediating differentiation, proliferation, and apoptosis. There is evi-

dence that physiological levels of ROS are critical for neuronal cell motility and maintaining the F-actin cytoskeleton that controls outgrowth (Munnamalai and Suter, 2009). We believe that ROS has a specific signaling role in neurite outgrowth and motility. Using bag cell neurons cultured from *Aplysia*, we use Phase imaging to assess the outgrowth rates of specific neurites. Then, we use fluorescent dyes DCF and Calcein Red-Orange to analyze the volume-corrected level of cytoplasmic ROS in the corresponding growth cones.

By comparing outgrowth rates and cytoplasmic ROS levels, we can begin to piece together the role that ROS plays in neuronal motility. Thus far, a direct correlation has not been found in long-term growth rates and cytoplasmic ROS levels. We are beginning to incorporate time-lapse imaging to find instantaneous growth rates and compare these with cytoplasmic ROS levels.

Although very little data has been collected using instantaneous growth rates, the results are suggesting a possible correlation. Knowing how ROS affects neuronal cell growth could significantly alter the way we approach neurodegenerative diseases and the attempts to manipulate neural tissue growth.

Poster 59: Qing Wei

“Sequence Similarity-based protein Function Prediction Visualization”

The Gene Ontology is a major bioinformatics initiative with the purpose to represent the gene and gene product attributes across species and databases by providing a list of terms. For this research, we are providing visualization for researchers to quickly identify and compare gene terms' relationships. Since visualization of gene terms prediction always involve large computation and client rendering, it is difficult to maintain efficiency, usability and accuracy.

Our research is focusing on developing a visualization tool for two protein functions prediction servers based on their output data with the tree hierarchy structure graph and allow user click and expand the term nodes. I approached this problem by implementing the backend query. Then I make attempts to find

the best web graph visualization tool including force-directed and hyper-tree to fit the protein graph structure. After going through the tools, I determined that using a more flexible library and implement the user interactions from scratch to achieve customization, and render performance. The end result is a web application that adaptively parses the prediction into a tree hierarchy graph with gene similarity colorization.

Poster 60: Natalie Vezina

“Climatological Impact of Galactic Cosmic Rays on Global Cloudiness”

The galactic cosmic ray “ cloud condensation (GCR-CCN) hypothesis proposes a physical mechanism for the generation of aerosols in the lower atmosphere (especially during Quiet episodes of the Sun when increased spallation and ionization are more capable of producing sulfate aerosols). The magnitude of the GCR impact can be monitored by surface-based neutron counters. This research project has focused on the capability of the proposed physical hypothesis to significantly affect global cloudiness and possibly the Earth’s climate.

NASA’s International Satellite Cloud Climatology Program (ISCCP) has provided the data for this study, consisting of global cloud amounts and type, as well as optical depth for the period 1984-2012. It has been discovered that the pattern of ‘deep convective cloud amounts’ correlates directly with the GCR anomalies, and not the total global cloudiness or the lower tropospheric cloudiness reported in previous studies (which have not stood the test of time). This is further supported by a general decrease in total global cloudiness, yet an increase in optical depth (that can only be explained by the increase in deep convective cloudiness with its greater optical depth and the general reduction in solar activity for the past three solar cycles).

Poster 61: Hannah Stewart

“Understanding protist lignocellulase activity in the digestion of wood in the termite, *Reticulitermes flavipes*”

The eastern subterranean termite, *Reticulitermes flavipes*, and its symbionts collaborate to breakdown wood for energy. They form an efficient bioreactor that could be used to help answer the current issue of utilizing renewable energy sources. It is known that bacteria and protists in the hindgut synergize with their host for the digestion of lignocellulose. Additionally, the removal of bacteria from the termite hindgut with antimicrobial treatments reduces, but does not abolish, lignocellulase activity.

The goal of this work was determine to what extent protists were affected by the removal of bacterial symbionts following antimicrobial treatments. The hypothesis was that protists would be negatively affected by the removal of bacteria. To test this hypothesis, I fed termites antimicrobial laced food for a week, removed their guts, extracted RNA and looked at gene expression of four protist lignocellulases using qPCR.

Gene expression data showed that each gene had a unique expression pattern in a given treatment. Thus, some genes supported my hypothesis while others refuted it. This suggests that both bacteria and protists play vital roles in termite digestion. My data highlight that termites and their symbionts should be considered together when trying to find novel sources of enzymes for biofuel applications.

Poster 62: Caitlin Specht

“Study of Coronavirus Protease Using CFP-YFP Fluorescent Assay”

Middle Eastern Respiratory Syndrome (MERS) is an emerging viral disease originating in the Arabian Peninsula with a current mortality rate of nearly fifty percent throughout Europe and Asia according to the World Health Organization. Like Sudden Acute Respiratory Syndrome (SARS), it is a coronavirus thought to be a zoonotic virus initially transmitted to humans from an animal host. Characterization of this disease is being done to determine the basis of viral replication and mode of transfer in order to identify druggable pathways in the virus life cycle. One such target for viral inhibition is the proteases responsible for cleaving the polyproteins initially transcribed from the (+) strand RNA immediately following infection. Once cleaved, the sub-compo-

nents of the polyprotein compose the viral replication complex. Without these proteases viral replication cannot occur, making them a prime target for viral replication inhibition. First, replication proteases were characterized using a fluorescence resonance energy transfer (FRET)-based substrate by measuring the amount of fluorescence emitted as a result of enzymatic activity. Each polyprotein cleavage site linked two fluorescent proteins that absorb light at a specific wavelength, transfer energy to the other protein, and emit light at a higher wavelength.. When the FRET substrate is incubated with the enzyme that targets the cleavage site, the fluorescence emitted at the higher wavelength decreases proportional to the amount of substrate cleaved, allowing a cleavage rate to be calculated. Based on the calculated cleavage rate, kinetic calculations were performed to analyze enzymatic activity. The results of these experiments will allow a comparison of replication proteases from MERS with replication proteases from other coronaviruses. Further analysis will be done to measure the cleavage rates of different coronaviruses. This study produces conclusive results for the characterization of MERS replication proteases that are essential in further development of inhibitor molecules.

Poster 63: Raghav Shankar

“Managing Large-Scale Data Centers from Smartphones”

Systems management of commercial data centers is a daunting task because they contain a large number of machines that need to be kept operational almost 24X7. It is important that system administrators are able to manage individual target machines and identify potential problems in order to reduce system downtime. Today this is done by administrators sitting at their desks in front of large screens attached to desktop-class computers.

The emergence of mobile platforms presents an opportunity in the way data centers can be monitored. Mobile platforms such as smartphones allow system administrators to remotely manage the activities of commercial data centers. For example, the system administrator can observe the trends in the system utilization and failure signals and optionally, take some corrective actions, such as, rebooting a server. We evaluate the functionality of current solutions, which indicate that they utilize excessive resources on the mobile device and limit

system administrators from efficiently monitoring data center activities.

In our research, we propose a system that allows system administrators to efficiently manage data center machines using mobile devices. The system consists of a middleware software which interacts with the target machines and a mobile application that the system administrators interact with. This work is done jointly with IBM and is demonstrated on IBM Blade Center-based data centers.

Poster 64: Carrie Myers

“Fluorescence-Guided Surgery for Prostate Cancer”

Current surgical techniques for cancerous tumor removal depend mostly on the surgeon's naked eye. However, cancer tissue can look similar to normal tissue and some cancers develop many small, scattered lesions instead of a single mass; this makes this strategy for removal very difficult, resulting in incomplete removal during surgery. Fluorescence guided surgery is a new idea in this field that is gaining strength through its improvements in cancer tissue detection and removal.

Many different cancers show differences in their physical properties compared to surrounding tissue, thus giving us an opportunity to selectively target and image them using a fluorescent probe. For prostate cancer, this physical difference is the over expression of prostate specific membrane antigen (PSMA). A developed ligand for this receptor, 2-[3-(1,3-dicarboxypropyl)ureido]pentanedioic acid (DUPA), when conjugated to a fluorescent dye, selectively targets, enters, and illuminates these cells.

In this study, localization of a fluorophore to prostate cancer cells is analyzed in vitro and in vivo and a comparison is made between compounds differing in their linkage between the DUPA ligand and the fluorophore in the molecule. The compound, DUPA-8aminooctanoic acid-phenyl-tyrosine-S0121 (NIR dye), was chosen to be the best out of those tested due to its high affinity for 22RV1 (a human prostate cancer cell line that over-expresses PSMA), higher fluorescence intensity in in vivo whole body imaging (about 10 times brighter than other compounds tested) and specificity for cancerous tissue over normal tissue.

Poster 65: Austin McGlannan

“Insights into North American Evolution Derived from Crustal Structure Across the Nd-line”

We investigate crustal structure across the Nd-line, a Proterozoic geochemical and geophysical boundary within the mid-continent of North America to learn about the growth and evolution of continental crust. The Nd-line marks the boundary between crustal rocks that formed from differing crustal and mantle sources. The rocks northwest of the boundary have Nd-model ages greater than 1.55 Ga while those to the southeast have ages less than 1.55 Ga. The location of the Nd-line also correlates with a change in long-wavelength magnetization. Using data recorded by EarthScope Transportable Array stations, we calculate receiver functions to investigate the thickness and structure of the crust.

These observations can be used to identify whether structural changes exist across the Proterozoic boundary. Our observations reveal that while the crust generally exhibits a similar thickness of 45 km on either side of the Nd-line, a trend of thicker crust ~50 km, runs parallel to the boundary. The zone of thickened crust along the boundary appears to mark a zone of crustal thickening that occurred during accretion, and suggests that features associated with continental growth endure at lower crustal depths. South of the Nd-line, patterns of crustal thickness coincide with current physiographic regions such as the Ozark Plateau, where the crust averages 43 km thick, and the Reelfoot Rift, where the crust thins to ~40 km. These crustal patterns appear to reflect more recent lithospheric deformation, suggesting that structures in the mid- and lower-crust appear to have been shaped by more recent tectonic events.

Poster 66: Alexandra Marmo

“An Assessment of the Extreme 2011 USA Tornado Season”

The year 2011 was the most deadly tornado season in the USA modern tornado record (1950-present). Tornado events for 2011 have been studied and compared to tornado statistics for the first decade of this century, to show the

extreme features of this record setting season. Although this extreme season experienced only slightly above average number of tornadoes, it achieved record accounts for a) the intensity scale (six EF5s and 17 EF4s), b) the number of deaths (562), c) average path length for the significant tornadoes, EF2 to EF5, from 9.3 miles to 52.6 miles, with one EF5 that tracked for 132 miles. Many of the significant tornadoes occurred in outbreaks on April 25-28 and May 31.

This study has shown the efficacy of the significant tornadoes to produce record fatalities for all intensity scales, including more than 300% greater than average for the EF3, EF4, and EF5 scales. It is further noted that nearly twice as many tornado deaths occurred in homes, compared to mobile homes, which is highly atypical in tornado fatalities. The probability of one or more deaths for the EF5 scale was 1.0, and the probability of a given death for a tornado event is associated with the EF3 scale, due to a combination of their intensity and the relative large number of events.

Poster 67: Yang Liu
“DNA nanomotor”

Nanomotors consisting of single protein molecules are abundant in living systems. Here we report a nanomotor made of a single DNA molecule. The DNA nanomotor can adopt two distinct conformations, intramolecular tetraplex and intermolecular duplex. The nanomotor switches between the two conformations through alternating DNA hybridization and strand exchange reactions, which enables the nanomotor to perform an inchworm like extending shrinking motion. When the single molecule nanomotor is loaded with two organic molecules, a fluorophore and a quencher, the motion can be viewed in real time by monitoring the fluorescent signal. The DNA nanomotor functions efficiently both in solution and on nanoparticle surfaces. Its simple yet stable structure, convenient operation, and high efficiency may make the DNA nanomotor practically useful for powering nanosystems in future applications.

Poster 68: Jasleen Kaur
“Enhanced isoprene production by the isolation of mutants in

**carbohydrate metabolism in the cyanobacterium *Synechocystis* sp.
PCC 6803”**

Enhanced isoprene production by the isolation of mutants in carbohydrate metabolism in the cyanobacterium *Synechocystis* sp. PCC 6803 Jasleen Kaur, Xiaohui Zhang and Louis A. Sherman Dept. Biological Sciences, Purdue University, West Lafayette, IN 47907 Cyanobacteria have a great potential to use sunlight and atmospheric carbon dioxide to make valuable bio-fuels. One such compound is isoprene. Isoprene is a major constituent of rubber, which is currently produced from petroleum.

Through this research, we intend to create a model for the productions of isoprene gas with the help of the cyanobacterium, *Synechocystis* sp. PCC 6803. This is a photosynthetic microorganism that has an excellent genetic system and which stores carbon in glycogen granules. We are constructing mutants in *Synechocystis* sp. PCC 6803, by blocking the function of the *glgA1* and *glgA2* genes, the two glycogen synthase genes, thus blocking the carbon flow towards glycogen storage, and enhancing the carbon flux towards the MEP pathway.

Along with *glgA1* and *glgA2* mutants, we are also constructing site-directed mutants in the phosphoribulosephosphate (PRK) gene to lower PRK activity. This is an important gene in carbon dioxide fixation and we needed to retain PRK activity, but reduce it by about 75%. We are beginning to characterize the 4 PRK mutants. The in-vitro activity is 20-80% depending on the amino acid changed.

We are now introducing the isoprene synthase gene to these mutants, and this gene is expressed by the strong *psbA2* promoter. These mutants then will be combined to measure further effect on the production of the isoprene. We will show our progress towards the goal of enhanced bio-fuel production.

Poster 69: Henry Hamann

“Improving Rational Drug Design with Protein-scaffolding Ligands”

High-quality protein crystals for use in structural analysis via X-ray crystallography have become increasingly important since the advent of structure-based drug design approaches. Determining high-resolution protein structural information relies on the production of relatively large, defect-free, single crystals and, despite advances in the production of such crystals, this step is still a major limitation in the pharmaceutical development process. A large number of experimental variables can affect optimal crystallization conditions including temperature, pH, buffer, salinity, precipitant type and concentration. Proper crystals are difficult to obtain due to structural flexibility of protein targets and the lack of universal, reliable methods for crystallization. These challenges reflect the need for continued development of improved strategies for the production of high-quality crystals.

The aim of this research is to use rigid, symmetrical nucleating ligands to facilitate production of diffraction-quality protein crystals, using green fluorescent protein as a model. These ligands are designed to non-covalently link protein molecules together to provide a scaffold and promote nucleation, followed by ordered assembly. We hypothesize that by using these ligands, nucleation can be initiated faster, lower protein quantities will be required, and crystallization can be achieved under a wider range of conditions, even those which do not typically promote growth. Further, we expect these ligands to be useful as a rational tool in achieving high-quality crystals for protein structure elucidation.

Poster 70: Jennifer Franks

“Mutations Changing Transcriptional Control of the ProU Operon in *Salmonella typhimurium*”

In high salinity environments, cells must be able to maintain equilibrium between internal and external osmolarity. Accumulation of uncharged solutes is one mechanism for coping with high external osmolarity. In *Salmonella typhimurium*, the ProU transport system is responsible for the uptake of uncharged solutes, such as proline. The proU operon is induced by high osmolarity. No transcriptional activators or repressors have been identified yet for proU.

The purpose of this project is to obtain mutations that affect transcription of proU in hopes of identifying and characterizing the regulatory machinery for this operon. A strain of *Salmonella typhimurium* that contains a proU-lacZ reporter fusion was used for this experiment. The strain was mutagenized with the alkylating agent, ethyl methanesulfonate, and a derivative that expressed the proU-lacZ fusion at elevated level was selected. P22 phage mediated mapping confirms that the mutation causing Lac⁺ behavior is neither within nor nearby the promoter region of the proU operon.

These preliminary findings indicate that an uncharacterized regulatory gene may be affected by mutation. Further research was conducted to pinpoint the location of the mutation and its exact nature.

Poster 71: Tiange Dong

“Logic patterns for finding functionally related genes in *Escherichia coli*”

Elucidation of gene function is a central problem in molecular biology. Usually gene function is determined by experiments and database search. However, this method is very time-consuming, laborious and costly to analyze every gene in a genome. Applying the method of logical computing, we contrive a program that uses many different reduced binary logic expressions to generate gene pairs and triplets in order to find the intrinsic biological property of these logic patterns.

The logic patterns are designed to represent the presence or absence of genes across different genomes of *Escherichia coli*. By computationally and manually checking biological relations of expressed products of gene pairs and triplets, we are able to examine whether the logic patterns are reasonably representing the corresponding biological relations. For certain logic expressions, they gave relatively good positive results percentage. Moreover, we noticed that some logic patterns have high percentage of positive hits over certain types of relations.

This novel method will allow us to better understand how genes interact and what type of relations they have. It could ultimately lead us to predict function

of uncharacterized and conserved genes.

Poster 72: Jack Conrad

“The Rheology of Acoustically Fluidized Sand”

There are current gaps in understanding the rheology of vibrated granular material (sand in this case) as a function of stress, frequency and amplitude of the vibrations in the sand itself. We constructed a rotational viscometer to quantitatively investigate the relation between the stress and strain rate in a horizontal bed of strongly vibrated sand.

In addition to the macroscopic strain rate, the amplitude and frequency of the vibrations produced by a pair of pneumatic vibrators were also measured with the aid of miniaturized piezoelectric accelerometers (B&K) whose output was recorded on a digital storage oscilloscope. The initial gathering of the experimental data was difficult due to granular memory, but by having the sand compacted vibrationally for 8 minutes before each run the scatter of data was reduced and we were able to obtain consistent results.

We find that vibrated sand flows like a highly non-Newtonian fluid, in which the shear strain rate is proportional to stress to a power much greater than one, where the precise power depends on the amplitude and frequency of the applied vibrations. Rapid flow occurs at stresses less than half of the static yield stress (that is, the yield stress when no vibration is applied) when strong vibrations are present. This demonstrates that vibrated sand behaves as a strongly nonlinear pseudo-plastic material that can also be approximated as a Bingham material with a rate-dependent yield stress. The flow of acoustically fluidized granular materials provides a reasonable explanation for crater collapse and long runout landslides.

Poster 73: Dhruv Bole

“Mechanistic Studies of a Clinically Relevant Bacterial Transporter”

The ATP-Binding Cassette, or ABC transporter, is a group of diverse proteins

involved in numerous diseases including genetic diseases such as cystic fibrosis, multidrug resistance bacteria, and cancer. The ribose transport complex in bacteria may serve as a model for how these transporters work in vitro. The purpose of this study is to determine how ATP hydrolysis morphs the complex from an 'open' to 'closed' position.

To determine the configuration of the proteins, ribose transport complexes associated with sequential stages of the transport cycle were isolated in the presence of different substrates, and by adding strategic mutations these complexes were studied using Electron Paramagnetic Resonance (EPR) spectroscopy to observe how protein interaction affected their formation. The results below show ribose interactions of the transmembrane domain (TMD), RbsA, with different variations when Mg^{2+} , vanadate, and ATP are added.

These results suggest that the complex 'opens' up when those three components are added together. Future experiments include how ribose interactions of TMD, RbsC, associate with ribose-binding protein RbsB, which in turn interact with nucleotide binding-domain RbsA. This clinically relevant complex could give us further insight to how these ABC transporters transport molecules to and from the cell.

Poster 74: Carlos Blanco

“Free Standing Semi-Flexible Composite Carbon Nanofiber Oxide Films Using Functionalized Carbon Nanotubes and Polyvalent Crosslinking Ions”

Historically, conjugated carbon nanomaterials, such as carbon nanotubes and graphene, have been studied for their electronic properties and applications in supercapacitive devices. In recent years, carbon nanofiber (CNF) has come under increasing study due to the similarities between the molecular structures of carbon nanotubes and graphene.

CNF is a nanostructure derived from the graphene carbon allotrope, in which a stack of graphene 'nano-cones' are held together to form long fibers. Its mo-

lecular arrangement consists of sheets of SP² hybridized carbon atoms forming large, interconnected conjugated pi systems above and below the molecular plane. This allows for transverse delocalization of electrons and leads to an electronically active material with many possible configurations. However, due to its low surface area and its inability to form colloidal suspensions, CNF can be regarded as an unfavorable material to work with.

By functionalizing CNF into carbon nanofiber oxide (CNFO), subsequently exfoliating, and reducing the fibers, the electronic properties are largely maintained, while allowing the material to form colloidal suspensions and increasing its structural stability. Stabilizing such a material into workable films would allow its use in electrical double layer capacitors among other applications.

Poster 75: Elizabeth Alperin

“Characterization of VGluT2-positive axon terminals in MGB of young and aged rats”

Age-related hearing problems can result in deficits in differentiating foreground and background noises, although the underlying mechanisms in the central nervous system are not fully-characterized. The sounds we hear are processed in the ascending auditory pathway through several layers of informational identification and extraction. One layer contains the Medial Geniculate Body (MGB), where excitatory message inputs from the Inferior Colliculus (IC) can be identified by the presence of glutamatergic synapses containing Vesicular Glutamate Transporter 2 (VGluT2).

We hypothesize that the decreased hearing ability of aged rats correlate to fewer excitatory axon terminals in the MGB, which is known to have different characterizations for the dorsal, ventral medial, ventral, and ventral lateral divisions based on structure and function. In an attempt to better understand the age-related changes in the auditory system during aging, VGluT2-positive axon terminals in the MGB subdivisions of young adult and aged Fischer 344 rats were labeled and the areas and density of these terminals were quantified using image analysis software.

Preliminary data shows a decrease in density with age for all subdivisions along with a decrease in size for the ventral subdivisions and an increase in size for the dorsal division. Further analysis is needed to increase sample sizes and further identify trends.

Technology

Poster 76: Carl Welker

“Man Portable Super Heavy Lift Device for USAF Special Ops”

The scope of this project was to design, build, and test a system to lift downed aircraft and armored vehicles weighing 45,000 lbs to 55,000 lbs from uneven, slope-shaded terrain to aid in rescuing wounded soldiers where vehicles may be on fire burnt and have hot, sharp metallic surfaces. This project was a nationwide university competition. The lift kits are intended for USAF Special Operations Command Pararescue Jumpers that can be man-portable and easily set-up, used, and repackaged by a single soldier and redeployed during secondary phases of military operations.

The main constraint for our system was that it had to perform up to the threshold limitations when taken to the university competition. To meet constraints such as weight and lift height, to name a few, in the best possible way we employed the use of a combination of steel and titanium materials to construct a two stage scissor lift system with an outer and inner pair of scissor lifts. The systems operate using a hydraulic piston combined with a method of alternating the locking of both scissor sets, which lifts the load and holds it in a stable position. This system conforms to the competition's requirements as best as could be achieved.

Poster 77: Kyle Thiele

“General Motors Frame Turn Over Monitor”

General Motors utilizes an operation that inverts truck frames during their assembly process. The frame is lifted off of the first carrier, called a pre-carrier,

flipped and transferred onto a post-carrier. The process of mating the frame to the post-carrier, has no monitoring or feedback system. This can result in improper mating of the carrier and frame.

Our team has researched inexpensive, efficient, and accurate ways of detecting the location of the post-carrier and frame in space. Laser and visions were investigated as possible solutions to the problem. After considerable research and consultation the team proposed a vision system that could be set up in two different configurations, as well as a laser system. Using a structured ranking and weighting process called an Analysis of Alternatives (AoA), the team down selected to a camera-based vision system would be best suited to the requirements and needs set forth by the customer.

A Cognex vision system was chosen, utilizing the In-Sight 7402 model camera along with the In-Sight Explorer software. Infrared lighting has been set up to allow for maximum control of the lighting environment. This system provides data for the location of the post-carrier and frame, and relates the positions of the two to ensure accurate mating.

Poster 78: Phil Stewart

“Recreating Exhaust Tones Efficiently in a Customer Interactive Acoustical Design Process”

Our project is a partnership with an automotive company, Faurecia, Inc. Faurecia wants to build an N.V.H. studio to replicate and manipulate the sound of a particular vehicle that meet their customers’ wants and needs, as an alternative to using expensive prototypes, and have quicker turn around. Our approach was to look into various ways of developing a studio that will replicate and have the ability to manipulate the sound you would hear as the driver of a particular vehicle. We have a studio room here on campus that we have treated acoustically, and implemented an audio system with software that will manipulate and provide feedback in the form of data and audio.

Poster 79: Devin Stalbaum

“Little Blue Book”

This project is intended to address the lack of workflow enabled procedure management systems in regulated industries by collaborating with the aeronautical department at Purdue for testing and proof of concept. Through our research into the aeronautical department we identified two areas of improvement: regular and immediate updates to procedure sets as sent by the FAA, and user interaction options such as favoriting and suggesting edits.

Our product will support both admins and users with a set of tools for interacting with procedure sets. By utilizing multiple search options to narrow down procedures, in addition to admin tools which edit procedure steps and reference relevant materials, we believe our product would greatly increase efficiency when edits are called for by regulatory agencies.

Poster 80: Mary Spalla

“Skeleton Crew - An Analysis of Automated Skinners”

In the development pipeline of animation, the rigging and skinning stages enable a 3D model to move. The rigging stage is a means of controlling the movement of a 3D model by use of joints (or bones) placed in areas where the model is intended to bend and twist. The skinning stage follows the rigging stage, it determines the amount of influence each joint has on the model. When a 3D model has been rigged and skinned, it is essentially a virtual puppet; it will move realistically based on how a person manipulates its skeleton and is thus ready for animation. The rigging and skinning process (or just “skinning” process, for short) is complicated and time-consuming, making the use of automated skinning tools more efficient and much cheaper.

However, the current literature on emerging commercial software in auto-skinning is unqualified and lacks documentation. So, animation and video game studios do not know what emerging auto-skinning products are available that meet industry standards. Some auto-skinning software companies are not even aware of their competition. Therefore, Skeleton Crew will provide—through research, evaluation, and product improvement—the premier, best, and com-

prehensive analysis of automated skinning.

Poster 81: Derick Shippe
“Faurecia Accelerometer Cooler”

The technology department was approached by Faurecia to help out with a problem that they have had for quite some time. Faurecia is an automotive supplier that makes exhaust systems for all sorts of vehicles. To help out with CAE they have determined that they need acceleration data from the vibrations and shocks that are associated with mounting said exhaust systems. Since these accelerometers were being placed very close to hot parts they have had issues with keeping them cool enough to survive and produce reliable data. They initially developed a system that would pump water through cooling blocks to provide some cooling. This has proven to not be the most reliable system since it has no feedback and no control.

Our task is to develop, design, build, and test a system that can be more reliable and more flexible to their changing needs from vehicle to vehicle. We have surveyed many techniques to cooling and have determined that their system is actually very effective for a mobile system that takes a lot of shock. Since that realization we have innovated their cooling design and have implemented a display and control system to offer the feedback that they need so that they have less accelerometers fail on the test track. We are now in the build phase and will be moving on to the testing phase very soon.

Poster 82: Devin Reed
“Steel Edge Detection System”

The cold mill in Nucor Crawfordsville has an issue with oscillating sheet damaging equipment and sacrificing quality for the final product. The premise of this project was to develop an edge detection system that would produce a signal to be sent to a PLC controlling the spool that will correct the location of the edge. In order to create such a system it was necessary to design a system that will be able to function in the plant atmosphere with an accuracy of a 1/16th of

an inch. This 1/16th accuracy ensures the system will be able to detect errors to the greatest accuracy the hydraulic system can correct to, ensuring the quality of the resulting product is improved for the current equipment.

The system was developed using research of existing systems and making improvements on the issues with those given systems. Multiple solutions were discussed such as laser systems, IR systems, and visual inspection systems using high speed cameras and pixel detection. The testing of the design was done using a small scale model using a test rig that moved a cutout of steel on a mount to check the functionality of the system developed as well as in the environment it will be subjected to. The use of an IR camera was used to ensure accurate measurements in the manufacturing environment where steam, oil, and dust were a large concern.

Poster 83: Jonathan Reed
“Vector Risk Analysis”

Safety has always been a very large concern in the aviation community. This is due to the fact that one small tiny mishap can easily lead to damage to an aircraft or equipment costing a company heavily with repairs and lost revenue, or even worse with death. One lost life is one too many. Currently the industry norm is to rely on experience from employees and related material provided from regulatory bodies. Risk is such an involved component of the aviation industry that a more in depth application of managing it is needed. With the development of automated information systems within Arbitrary XML Rendering (AXR) whereby data is entered at the field, regional, and often the headquarters level, a systematic methodology is required to quantify the data for both reporting and historical purposes.

The ideal purpose of this project to help safety and maintenance managers better track ongoing and future maintenance tasking, along with real time risk to personnel and equipment with the ability to recognize future unacceptable risks. This would eliminate the need to rely on an individual's experience. We are not trying to eliminate a job or position, but to make it so that the individuals whom do not possess the years of experience of recognizing hazards have

readily available risk assessment data.

Poster 84: Arnav Palnitkar
“StoreFront Solutions”

This project proposes a marketing solution for small businesses while identifying a relationship between online marketing and sales. The advantages and power of web is immense so there is a need to promote small and ‘hyper local’ businesses on web due to high competition and potential outreach of customer base.

This low-cost solution will establish a web presence for businesses by providing them a platform to engage customers at the same time equipping them with emerging technologies to sustain in this competitive world. Web presence with social media integration using self-developed CMS and iBeacon (Bluetooth 4.0) for interacting with in-store customers will be the central pillars of this solution. Our team understands the importance of web marketing, so our project focuses on promoting small and ‘hyper local’ businesses using the power of web and emerging technology.

Poster 85: Kearsten Olson
“L. Press Instructions”

The L. Press is a simple machine that is used to press biomass farm waste material into flammable briquettes to use for clean sustainable fuel, specifically for boiling water, cooking, and heating. For coffee farmers in underdeveloped countries who need to assemble the L. Press, we are making a set of graphical instructions to be distributed via the internet so that anyone with a language barrier can understand the assembly process. While processes for graphical instructions have been used before, no such instructions exist for the L. Press. Using channels through Greyhouse, we anticipate farmers gaining access to these instructions so they can build the L. Press to help better their quality of life.

Poster 86: Steven Olson

“Littler Diecast Inspection Automation”

A team of Engineering Technology students from Purdue University are working to streamline quality inspection for Littler Diecast Corporation. Littler Diecast produces aluminum disks to be used as fans in industrial alternators and needs an automated process to inspect and sort disks between diecasting and final machining. The engineering team is using an array of lasers to scan each disk individually and inspect them for warping and other flaws.

The results of the team’s work is a fully integrated and automated inspection process, which requires no human interaction or intervention. The team’s work relies on three laser distance gauges to scan the disk and set a plane of reference and ‘predict’ other distance values, which are then compared predicted vs measured to find the total variance from perfection in the disk.

The team is working alongside engineers from Littler diecasting to bring the system into full production in the late spring of 2014.

Poster 87: James Moore

“Experimental Virtual Reality UI”

With the introduction of more affordable virtual reality hardware, game designers are looking to implement support for these devices in their games. Due to the increased demand, there is a need for a more immersive user experience with consumer level VR hardware such as the Oculus Rift. One of the major drawbacks to the current VR goggles is the phenomenon known as ‘simulator sickness’ which is brought on by vestibular mismatch between what you see and what you feel. With new this new technology at our disposal, we find it prudent to research in this emerging device’s capabilities and better understand how it changes the gameplay.

Unlike current virtual reality user interfaces, ours will incorporate the a unique new UI element that we hope will allow for a fixed frame of reference for the

user and will reduce the effects of vestibular mismatch. Our tests will focus on testing this new UI element against using the Oculus Rift without it between three games of varying pacing. We will compare level of simulator sickness between users who play the games with our product integrated and those who play without it. Tests will be conducted using multiple Unity games that normally induce a higher level of nausea when played. We hope the results of our data show that our product does have a significant impact on reducing simulation sickness.

Poster 88: Ethan McDonald

“2xForce”

Leaders in Commercial Construction, such as Holder, have an interest in finding more effective ways to present design information to prospective clients. The information contained in a computer model may be difficult for some project personnel to understand. A 3D printed model can assist someone who is having difficulty visually understanding a potential design concept, and unlike a computer model, printed models allow for a physical representation of design intent.

This can potentially eliminate confusion with the representation of a computer model in 2D space. Our research will focus on measuring the effect of haptic versus digital models for those in the construction industry utilizing 3D printing.

Poster 89: Melanie Martin

“User Experience and Student Engagement in Higher Education”

The Computer Graphics Enterprise (COGENT) is used in Purdue University’s Department of Computer Graphics Technology as an artificial currency to encourage students to engage in activities inside and outside of the classroom. To earn Cogent, students place requests through a departmental e-banking system called the Cogent Management System (CMS).

Currently, the Cogent Management System has not realized its engagement potential. Upon holding focus groups it was discovered that users found the system was difficult to use. Furthermore users desired competitive and rewarding features in the system. Through designing a new interface, gamifying the system, and incorporating an e-badge-based reward system we hope to prove that the behavioral intent of users to engage the system will increase by a statistically significant margin.

Poster 90: Dahlon Lyles

“Man Portable Super Heavy Lift Device for USAF Special Ops”

The scope of this project was to design, build, and test a system to lift downed aircraft and armored vehicles weighing 45,000 lbs to 55,000 lbs from uneven, slope-shaded terrain to aid in rescuing wounded soldiers where vehicles may be on fire burnt and have hot, sharp metallic surfaces. This project was a nationwide university competition. The lift kits are intended for USAF Special Operations Command Pararescue Jumpers that can be man-portable and easily set-up, used, and repackaged by a single soldier and redeployed during secondary phases of military operations.

The main constraint for our system was that it had to perform up to the threshold limitations when taken to the university competition. To meet constraints such as weight and lift height, to name a few, in the best possible way we employed the use of a combination of steel and titanium materials to construct a two stage scissor lift system with an outer and inner pair of scissor lifts. The systems operate using a hydraulic piston combined with a method of alternating the locking of both scissor sets, which lifts the load and holds it in a stable position. This system conforms to the competition's requirements as best as could be achieved.

Poster 91: Bakytgul Khaday

“Lenze Demonstration Robot”

The purpose of this project is to create a three-axis delta robotic control system for demonstration and marketing using Lenze products. Lenze would like to demonstrate their control products in action through three innovative and interactive game applications using the three-axis delta robot in order to engage possible customers at trade shows and marketing events.

The approach to this project is twofold. First, create a robot that not only engages possible customers, but also provides selected winners with a Lenze branded product. The project will consist of five major milestones as follows: robotic assembly, table design and fabrication, game application design, controls and algorithm creation, and HMI graphical design. The task of this robot is to challenge the prospective customer through three different game applications (Find The Ball, Memory Game, and Black Jack). The games will demonstrate use of logic and decision making to test the intelligence of the competing operator user.

The implementation of three unique and radically different game applications into one robot will illustrate to the customer the true power and quality that Lenze products have over their competitors. The potential customer will walk away with not only Lenze in the back of their minds, but also a branded product in their hand.

Poster 92: Max Karbin

“HangTime”

Currently, airline maintenance performance is limited by an environment which lacks a visual information delivery system to enable the effective communication and management of aviation technicians by the Lead (Supervisor). The FAA’s currently mandated Task Card (airworthy documentation) management system leaves Task Card tracking to the memory of the Lead, while subsequent task card information is kept in paper format then stored digitally as copies on basic databases upon job completion.

For our project, we are developing a digital Location Management System to be used by the Lead to effectively assign work instructions, incorporate personnel

tracking features, and allow for the ability to communicate cross-platform. We are also developing a mobile work instruction application, which will allow for aviation technicians to summon document authors for the task in question for proper authorization of the work instruction, as well as the ability to view their assigned tasks, and will be a companion application to our digital Location Management System.

In this project, we are trying to determine if with the use of a digital Location Management System and mobile work instruction application, are airline maintenance supervisors able to better assign and organize job tasks of their aviation technicians?

Poster 93: Sean Heckman-Davis
“FocusFilter”

FocusFilter is in progress of development of a suggestion system for a College of Technology web page to guide prospective students to majors relative to common interests and abilities that coincide with images we provide them to choose from. Based on testimonials from current staff and students, the present College of Technology website provides an abundance of helpful information.

However, that information could be presented in a way that will better engage 17-18 year old students, allowing them and their parents to see the most relevant information about a particular major or degree program. By tailoring this information to a prospective student’s interests and or goals, we can eliminate excess information and help students to better choose their path at Purdue.

Our focus is to create a successful interface that accurately suggests majors in the college that they should look into, based on the images they select in a sequence of questions. Research on college websites, college recruitment, gamification and marketing are all components of the development of this product. The team is currently conducting studies to determine student and parent impressions of the product’s system navigation, suggestion accuracy, information relevance and Purdue overall as a college choice.

Poster 94: Ethan Graber

“Aboard the International Space Station: A Game-Based, Virtual Reality Application to Inspire, Educate, and Entertain”

The collective awe, wonder, and inspiration the nation experienced in the days of the Apollo missions, and the effect they had on the aspirations of millions of children around the world, cannot be understated. Though today’s space program may not have the cultural presence of past initiatives, we must not overlook the monumental technical and political achievement that is the International Space Station (ISS). The ISS is arguably the very pinnacle of manned space operations yet it seems the youth of today do not share the inspiration Apollo engendered.

To educate and inspire the public about the ISS and its mission, we propose a game-based, virtual reality simulation of living and working aboard the ISS. Using the cutting edge Oculus Rift virtual reality (VR) display “ a VR display of unprecedented resolution and overall performance “ in combination with the Razer Hydra, a hand motion-based game controller, it is possible to create a profoundly immersive simulation of living and working in microgravity aboard the ISS.

Within a game-oriented incentive structure, players will conduct tasks based upon actual past experiments on the ISS. It is hoped our simulation can inspire a new generation of potential space-bound pioneers. Development is currently underway with our first user test to be completed by early late Spring 2014.

Poster 95: Jose Garcia

“3-D printer filament extruder and 3-D printed parts directional mechanical properties”

This work presents the results of the construction of a 3D printer filament extruder and the investigation of the directionality of the fibers in low cost 3-D printed probes. The goal is to characterize mechanical properties of the material as a function of the printing orientation. Preliminary test results will

be presented giving rise to a new methodology to estimate the integrity of 3D printed parts.

Poster 96: Annette Freidline
“2 Hour Fire Rating”

Koontz-Wagner would like to market their packaged electrical solutions with a 2 hour fire rating. This certification can be obtained from through ASTM or UL certification laboratories. In order for their walls to pass the certification process, some changes in their design need to be implemented. The first step was to fully understand the certification process and attempt to duplicate it in the Purdue Foundry Laboratory. The next step was to benchmark others as a starting place for researching alternate materials. Finally, tests of different insulation materials in combination with sealants and thermal breaks were done to find the most economical and time effective combination of changes they may make to their product before sending it to a certification laboratory for an ASTM or UL rating.

Poster 97: Daniel Ford
“Buckle Buddies”

A device/toy called a Buckle Buddy is an interactive toy attached to the seat belt. Much like potty training, this device is aimed to encourage children to be self-sufficient and buckle their own seat belts. When a child goes to buckle themselves in, they will grab the friendly ‘buddy’ extender and buckle in. When the child is buckled in, a sound will be produced. This is meant to entertain children while at the same time informing the parent their child is buckled in. It will also notify the parent if the child was to unbuckle their seatbelt while the car was moving.

We designed and built the plastic shell that goes into the ‘buddy’ and electrical hardware for this project. We used an existing seatbelt extender and built our housing around it and made sure that the seatbelt still functions properly. The designed housings were rapid prototyped a few times to make sure that the

extension and electronics would fit in them properly.

Once the final prototype is finished, we plan on testing this device with children in the future and get their perspective. If the children and parents enjoy this product, we will be able to have a working model that our sponsor can pitch to a manufacturer. We hope this device will help revolutionize the way that we teach children to buckle up and help to keep kids safe.

Poster 98: Yan Fang

“Visualization of Product Structural Hierarchy based on CATIA Automation”

In engineering product design and manufacture, massive amounts of complicated data are involved. Effectively and efficiently handling these data plays an indispensable role in product lifecycle management (PLM) and facilitates successful operation of companies. However, traditional ways of product data management (PDM) is facing many problems such as the challenges of tracking and synthesizing product information dynamically, how to visualize complex product structural hierarchy clearly and interact with hierarchy data. Based on CATIA automation and knowledge based engineering approach, this project aims to provide a new way to visualize product structural hierarchy data and enables designers and engineers to manipulate visualization graph directly in order to change hierarchy data in CATIA. CATIA Visual Basic (Macro) has been chosen as the main programming language because of its easiness of using a Graphical User Interface and build-in debugging ability. With Macro, we can export the hierarchy data in CATIA model to Excel spreadsheet and visualization graphs and vice versa. Furthermore, we will use Macro to automatically create different visualization graphs including node-link diagram, sunburst partition and tree map. Also, our project will enable users to directly manipulate components and parts in the visualization graphs and bill of materials.. For instance, the hierarchical relationship in the RC helicopter model will be exported into the BOM and a node-like diagram with a set of layered nodes. In the meanwhile, users will be able to modify the CATIA model by changing the parameters in Excel spreadsheet or the nodes in the node-like diagram. In other

words, technicians, operators and engineers are exposed to a simpler yet more straightforward editable visual content. The application of the research is nearly unlimited with knowledge based on engineering. It will save task repetition, facilitate continuous improvement and reduce the possibility of human error and thus considerably increase the manufacturing efficiency.

Poster 99: Andrew Evans

“Simultaneous Temperature & Pressure Controls for the Characterization of Micro-Electronics”

The goal of this project was to upgrade the MMR vacuum probe station at the Birck Nanotechnology Center in the Electrical Characterization Laboratory with a pressure controller and a mass flow controller to manipulate the level of the vacuum in the chamber along with a simultaneous temperature control. The data input and displayed output is through one main computer which the operator will control to get the desired environmental settings required for their experiment. Prior to this project, it wasn't possible to control a variable vacuum environment which the user needed to regulate for the various vacuum experiments. The entire system needed to be automated so a user could concentrate on the experiments that needed to be done. The temperature and pressure settings could easily be programmed into the Graphical User Interface (GUI) and saved in a 'settings file' for a similar experiment at a later time.

The plan of action included analyzing the attainable pressure inside the chamber and modifying the system so an operator would be able to maintain a certain degree of accuracy for the desired pressure needed. The necessary components were purchased and implemented into the existing system so everything would work together and be easily manipulated by the operator. The testing phase included utilizing various pressure gauges to simultaneously measure and verify the correct pressure in the chamber.

Poster 100: Brandt Cotherman

“Acoustic Resonance Testing”

Our objective is to design, create and implement an Acoustic Resonance Testing (ART) inspection technique to be used by Zimmer. ART involves striking a sample part and then after the impact with the specimen it will vibrate with certain characteristic modes and frequencies that can be measured by a microphone or laser vibrometer. In our case, we are using the microphone technique. Software is then used for the acoustic sonic and ultrasonic resonance analysis in this non-destructive testing technique. ART allows us to test a wide range of Zimmer product lines with inspection cycle times that are shorter than processing cycle times. Typical detected defects when using ART can include cracks, cavities, detached layers, material inconsistencies and hardness deviation in materials. All of which would be very beneficial for implementation at Zimmer. For our testing, we will test the bond integrity of bone growth coatings on a variety of joint replacement components. We will also try to implement the use of ART to replace x-ray testing for internal defects due to casting. X-ray testing is already a non-destructive test, but it is also a costly inspection test. Acoustic testing used for non-destructive testing of materials is a very old technique that has been used by many throughout the ages. For instance the collectors of antique and or fine glass and porcelain will excite a part by tapping which causes the part to vibrate. The object's quality is then assessed by the sound produced since cracked glass rattles instead of ringing. ART testing of materials in mass-production is a well proven technology, having been successfully implemented in various industries with the manufacturing of various products. Reliable integration into a production cycle of a few seconds even under mass-production conditions is often possible without any difficulties. The advantages of using ART inspection include; being non-destructive, use of Gage R&R capable technology with variable data outputs, and can be cost effective. Our desire is to implement and surpass all of these ideal solution standards as preferred by Zimmer.

Poster 101: Amadou Anne

“Hangar of The Future - Adaptive Work Instruction Development (E-Flex)”

A problem exists in that current access to technical data in aircraft manufac-

turing and maintenance operations is limited in volume and quality when performing a given task. Technicians typically have to interrupt their work flow in order and leave their immediate work areas to get access to additional information and data regarding their tasks. Aside from the considerable loss of time incurred by these actions, the technicians also tend to lose concentration, which may in turn lead to a great loss of efficiency and work quality and increase the safety risks.

Research Purpose Statement: This project is a continuation of research and development performed in Purdue 's Hangar of the Future lab that aims to develop a hybrid work instruction for air vehicle manufacturing and maintenance operations. The purpose of the project is to develop paper-based work instructions that exploit the technological capabilities available (PCDs and computers) in order to deliver additional information to the technicians when needed, all in a simple, intuitive and efficient package.

The goal of the project is to demonstrate that such work instructions are viable improvements over the current paper or digital versions. This project will also demonstrate the potential for integration with other Hangar of the Future projects in order to create a truly interactive system that will drastically improve the quality, safety and efficiency of any manufacturing or maintenance operation.

Poster 102: Nigel Agboh **“Littler Diecast Inspection Automation”**

A team of Engineering Technology students from Purdue University are working to streamline quality inspection for Littler Diecast Corporation. Littler Diecast produces aluminum disks to be used as fans in industrial alternators and needs an automated process to inspect and sort disks between diecasting and final machining. The engineering team is using an array of lasers to scan each disk individually and inspect them for warping and other flaws.

The results of the teams work is a fully integrated and automated inspection process, which requires no human interaction or intervention. The team's work

relies on three laser distance gauges to scan the disk and set a plane of reference and 'predict' other distance values, which are then compared predicted vs measured to find the total variance from perfection in the disk.

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Krannert School of Management

103: Jake Davis

“Data Reliability as it Relates to Engineering Co-op Students”

Administrators and researchers at a large Midwestern research university track the number of engineering students that accept Co-op positions during their time as undergraduate students at the university. These records are used to track student progress and attract prospective students to the university because of the potential for work experience. The data, representing the primary data set in this study, is collected by the Office of Professional Practice and tracks which students accept co-op positions. The Multi Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD) data set represents secondary data collected from six institutions. MIDFIELD is a tool used to track students as they advance through their engineering program.

The purpose of this study was to perform a comparative analysis using descriptive statistics to check reliability of the data. The data includes records of engineering students from 2005-2009 and will be compared on the basis of race, gender, year in the engineering program, major, graduation rate, GPA, and the year they started the Co-op program. The result of this study shows the reliability of secondary data which has implications for program development and policy decisions.



**Thank you for joining us in celebrating the
undergraduate research here at Purdue!**