PURDUE
UNIVERSITY

2013

Undergraduate Research Poster Symposium

ABSTRACTS

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Poster #1/ Humanities/Social Science

Title of Poster: Text messaging enhances nutrition knowledge and behavior among college students: "Mobile MyPlate"

Presenter(s): Lauren O'Connor

College: Health and Human Sciences

Advisor: Dennis Savaiano

ABSTRACT:

This study evaluated the effect of receiving repetitive educational text messages containing the MyPlate icon and USDA's Dietary Guidelines (DGs) on college students' knowledge as well as fruit and vegetable consumption behavior through a program entitled "Mobile MyPlate". The intervention group received biweekly text messages for 7 weeks containing the DGs and the MyPlate icon. The control group received the same information in a mailed brochure during week one. A pre- and post-online survey assessed the students' knowledge of the MyPlate food groups, the DGs and fruit and vegetable consumption. The intervention resulted in a significantly greater recognition of the MyPlate food groups ($p<0.05$) as compared to the control and a trend toward improved knowledge of the DGs. Fruit consumption was significantly elevated ($p<0.05$) and there was a trend toward elevated vegetable consumption in the intervention group. There were no gender differences in the effectiveness of the intervention. Texting repeated messages appears to be an effective and efficient way to increase nutrition knowledge and behavior of college students. This research was supported by Purdue University.

Poster #2/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Biomass Briquettes in Africa

Presenter(s): HannahJoy Pheasant

College: Engineering

Advisor: Dr. John Lumkes

ABSTRACT:

Many countries lack a sustainable supply of wood for fuel because trees that survive the climatic conditions are prematurely cut for firewood. Women spend hours gathering wood for cooking so that the lives of their families are not risked by unsanitary water. There are food and agricultural waste materials rich in carbon that could be burned instead of firewood. However, this waste material is usually difficult to carry, and not dense enough for a controlled fire. If these waste materials could be compressed to a higher density as a solid briquette, that energy could be used in a beneficial manner. In order to make compact briquettes, a press is needed. Selling a hand-press to individuals for personal use was theorized to be a sustainable approach to introducing biomass briquettes. A comparison of existing press designs was conducted. A new press design was developed to produce higher pressure, thus allowing a wider range of biomass materials to be utilized. Feld testing in Cameroon found that the new design produced more pressure than the design in use but it took significantly longer to produce the same quantity of briquettes. Market surveys were conducted in a rural and an urban location in Cameroon to determine fuel costs and interest in making biomass briquettes. Most rural respondents were not interested in a fuel source that they would have to pay for. A majority of urban respondents were interested in the idea of producing their own fuel as they currently buy it. The price range they were willing to pay for a press (5-10 USD) is significantly lower than the cost for a hand-press (30 -165 USD). Some respondents were interested in buying a hand-press that could be used as a small business. The results from Cameroon led to the idea of selling the briquettes. A Kenyan entrepreneur in an urban community was partnered with for this purpose. The entrepreneur conducted a supply chain survey to determine if sufficient quantities of waste biomass could be obtained. He also conducted an informal market survey by producing several batches of briquettes for his wife and neighbors to try. He did not just hand out the briquettes, but showed people how to use them and explained how they worked. Consumer's response was positive. Within a few weeks, there was greater demand than could be met with the single prototype hand-press. With consumer education, small businesses selling biomass briquettes are a viable option in Africa.

Poster #3/ Humanities/Social Science

Title of Poster: The Dark Scales of Justice: The Legality of the 1692 Witch Trials in Colonial America

Presenter(s): Cade Carmichael

College: Liberal Arts

Advisor: Melinda S. Zook

ABSTRACT:

While the events in Salem have traditionally taken center stage, there were a large number of other witch trials in Colonial America in 1692 which require examination. It is important to determine if these trials were statutory and followed the codified standards of the period. This project defends the proposition that these trials were mismanaged and presents evidence to display that the trials deviated from legal procedure. The primary sources which have been analyzed include court minutes from the trials themselves, such as the *Hartford County, Connecticut, County Court Minutes, Volumes 3 and 4 1663-1697*, as well as additional primary accounts of the trials by individuals such as Ambrose Finn, a court clerk in Pennsylvania during the witchcraft outbreak of 1692. Secondary sources from historians such as Bernard Rosenthal and Paul Boyer have been utilized to facilitate a more thorough understanding of the social atmosphere in which the legal analysis takes place. Current historiography is devoted to the legacies of the trials, rather than to specific breaches of legal code. The findings of this project provide insight into the exact situations and laws that led not only to legal changes, but also to the pardons later granted to their victims.

Poster #4/ Innovative Technology/Entrepreneurship & Design ****

Title of Poster: CAD Interaction in 3D Space

Presenter(s): Joseph Wesolowski, Dave Silberberg, Kyle Rector

College: Technology

Advisor: Professor Nathan Hartman

ABSTRACT:

The new Leap Motion Controller, from Leap Motion Incorporated, allows users to interact with their computer screen with hand gestures. The device can capture motions of your fingers in 3D to the accuracy of 1/100th of a millimeter. This innovative device will soon be available to the public and is being developed to work with anything from video games to aiding with medical data. However, current mouse-based interaction with CAD systems does not provide an intuitive way to manipulate the system in 3D space using gesture interpretation. Through development of integrating the Leap Motion controller with CAD systems, we will find research in the coming months after development, that will show the products effectiveness or non-effectiveness with professional CAD software operators.

Poster #5/ Physical Science

Title of Poster: Superior Optical Absorption in CdTe

Presenter(s): Kailu Song

College: Engineering

Advisor: Vicki Leavitt

ABSTRACT:

In order to improve efficiency and save energy, nanostructure materials have received considerable attention. Nanostructure materials have high absorption and low reflection which to absorb much more energy compared to traditional materials such as copper. In this study, the absorption of CdTe (Cadmium telluride) nanowires are theoretically and experimentally investigated to show that CdTe has superior optical absorption properties when the wavelength of incident light and thickness of thin film are given. This research incorporates three methods: theoretical analysis, computer simulation, and direct experimentation. At first, considered about the CdTe is inhomogeneous medium, we used effective medium theory as theoretically analysis to transfer porous media to homogeneous media and combined with Maxwell's equation to calculate the absorption of CdTe as a function of incident light wavelength. The second and more accurate course of action involves using Comsol Multiphysics software to simulate the porous CdTe. In the last method, we synthesize CdTe samples and use a spectrometer to measure the absorption directly. We expected that the results obtained will be consistent through these different approaches and will support determine the conditions in which CdTe has superior absorption. This data can be applied in the photovoltaics industry to achieve higher solar energy absorption and lower energy costs.

Poster #6/ Humanities/Social Science

Title of Poster: Women and Economic Development in the Middle East and North Africa

Presenter(s): Lindsay Markle

College: Liberal Arts

Advisor: Angela Phillips Diaz

ABSTRACT:

The policy brief addresses the issue of women's economic participation in the Middle East and North Africa. Women are dramatically underrepresented in the Middle Eastern and Northern African workforces, despite their high levels of education attainment. Cultural barriers, such as traditional gender roles, discourage women from entering the workforce and limit the overall productivity of several Middle Eastern and Northern African economies. During the Arab Spring movement, women have an opportunity now more than ever to capitalize on the changes in government structure to get involved in the public and private sectors. In the policy brief, three policy alternatives are assessed as options to improve women's economic participation in the Middle East and North Africa- education reform, legal gender equality, and improved access to loans and financial resources. All are viable alternatives but repercussions for each decision must be taken into consideration. A combination of the three would greatly improve women's economic participation in the Middle East and North Africa.

Poster #7/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Proprioception Studios

Presenter(s): Stephen Garver, Kyle Deak, Michael Baeza, William Huynh

College: Technology

Advisor: Professor Hassan

ABSTRACT:

Many animations can benefit from muscle deformation. The current solutions for deforming muscle in commercial animation software are not intuitive, easy, or time efficient, which inadvertently creates barriers to entry: students have no means of learning and animators view it as too expensive. We learned that muscle deformation in animation has been an issue for many years now. New solutions have appeared in the past few years that intended to simplify the process, but failed to garner significant interest. While larger animation studios have their own in-house software, commercially available software is still widely used. A series of scripts and pipeline tools that work in conjunction with preexisting software can streamline the process and lead to much more timely and realistic solutions. Muscle deformation is not stylistically accurate for everything, but where appropriate, muscle deformation will no longer be seen as too complicated and expensive to implement or learn.

Poster #8/ Humanities/Social Science

Title of Poster: The Maturation of the Mexican-born Immigrant: A Shift in Social Activism

Presenter(s): Connor Shearer

College: Liberal Arts

Advisor: James McCann

ABSTRACT:

This analysis focuses on the maturation of the Mexican-born immigrant in the United States in the country without citizenship or legal working papers. The analysis gives a synthesis of sources discussing what social activism is and how it has evolved over the years to lead into findings from a survey administered both in 2008 and 2012 during the campaign season leading up to the presidential election. The findings show that the particular demographic in the minority group has become both increasingly more knowledgeable and active in American politics. From there the analysis gives reasoning as to why this is and what it will mean for the country and the specific demographic in the future.

Poster #9/ Humanities/Social Science

Title of Poster: The Arab Springs and the Spillover Effect

Presenter(s): Cody Wilson

College: Liberal Arts

Advisor: Mangala Subramaniam

ABSTRACT:

The Arab Spring of 2011 was a historical social movement, unprecedented in its scope and possible effects. I was ecstatic to see the possibility of real social and political change in the Arab region, and furthermore interested in learning what made this revolution happen and how the movement spread to so many countries in the Middle East and North Africa region. Using news sources, Facebook Groups, YouTube videos, Twitter accounts, and the few scholarly articles written at that point, I looked to find similarities between individual movements and evidence for the spillover effect. I found that specific strategies, philosophies, and frames of revolution were most often spilled-over through direct and indirect contact of social media and independent news media. These findings give us great understanding of what specifically was used to insight the Arab Springs, but go even further to also suggest how social media and modern communication will change social movements and how they operate.

Poster #10/ Life Science

Title of Poster: The effect of gypsum on crop quality and environmental stability

Presenter(s): Owen Jamison

College: Science

Advisor: Javier Gonzalez

ABSTRACT:

The use of fertilizer can dramatically increase crop production, however knowing what amounts to use and the consequences on the environment are vital. In this study the application of gypsum to improve crop quality and yield while maintaining environmental sustainability was analyzed. One of the focuses of this broad project includes observing soil emissions during the growing and harvesting seasons. In order to determine the impact of gypsum on soil emissions two bean varieties were planted with either cover crop or no cover crop and applied with gypsum. Emission samples were collect from constructed sealable gas chambers and analyzed to determine the carbon dioxide, methane, and nitrous oxide content. The results indicate that temperature and moisture content largely determine the emission flux and no significant changes were observed between the two varieties and the control groups. The extended periods of high heat with no precipitation as well as not sampling during planting and initial growing months is believed to have caused this similarity in distribution. For this upcoming season emission sampling will begin right after planting occurs and the gas chambers will be modified to obtain a better seal.

Poster #11/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Eleventh Hour

Presenter(s): Caitlin Barnett, Vincent Hornbach, Billy White, Julie Ziolkowski

College: Technology

Advisor: Ray Hassan

ABSTRACT:

Knowing the best steps to render fur in Autodesk Maya and get the specific results a user is looking for can be a very daunting task. Without any research on the subject, using fur can give problematic results and skyrocket render times. However, bringing in third party rendering systems to streamline the process is an added expense. Eleventh Hour looks to create a pipeline for Maya users on a low-budget, such as students, small start-up companies, and hobbyists, that will give a detailed description on how to get the effects they desire with minimal hassle. This will encourage the use of Maya fur by making it more available to people who don't have the funds to resort to outside render engines. It will also reduce the need for users to scour 3D technology website forums for advice on the best way to go about creating and rendering fur.

Poster #12/ Humanities/Social Science

Title of Poster: The "Immortal" Boilermaker: Exploring the Forgotten History of Harry Guyer Leslie

Presenter(s): Elizabeth Hudson

College: Liberal Arts

Advisor: Kristina Bros

ABSTRACT:

Often, the only remaining evidence of community events and distinguished, local individuals are memorials, archive collections, and rarely seen documents. Many communities have access to such documents; however, as the available access to these collections becomes unrecognized, so does the history and remembrance of the individuals and events. The purpose of this research was to determine the source of a small, tarnished trophy in Orlando Itin's sports memorabilia collection in Bruno's Pizza Restaurant. This trophy stands as one of the unrecognized items of living history in West Lafayette, Indiana, which spurred the research and development of a further question: how can community historians discover the concealed facts of their local history? Throughout this research, personal interviews and careful searches were conducted through Purdue archives, local collections, online databases, and academic journals to recollect the memory of the recipient of the forgotten trophy, former Indiana Governor Harry Guyer Leslie. Leslie was a Purdue graduate and a survivor of the infamous 1903 Purdue Wreck. He made numerous contributions to the University and overcame adversity to become governor of Indiana, but his memory and contributions to the University and state are barely documented. This research explores not only Governor Leslie's history, but also examines the methods community historians can use to conduct their own local research.

Poster #13/ Humanities/Social Science

Title of Poster: "'Bra-less Bubbleheads' and the Bionic Woman: Images and Stereotypes of Second-Wave Feminists, 1968-1980"

Presenter(s): Kristen Blankenbaker

College: Liberal Arts

Advisor: Professor Gabin, Professor Zook

ABSTRACT:

The emergence of the feminist movement from 1968-1980 not only affected numerous political and social advances for women, but also created a strong stereotype that continues to negatively impact the woman's movement today. My research involves the study of images and stereotypes of second-wave feminists and the ways in which news media representations of feminism affected the course of the movement. I conducted an event-focused research using four definitive events: the 1968 Miss America pageant protest, the 1970 Women's Strike for Equality, the 1973 Billie Jean King v. Bobby Riggs "Battle of the Sexes" tennis match, and the 1977 National Women's Convention. I examined these events and the change in imagery by examining four newspapers, two weekly magazines, three television networks, and two pro-feminist magazines. I analyzed how media depicted the feminist movement in addition to the validity of feminist stereotypes and how feminists responded in their own publications. While the gains made by the women's liberation movement improved media imagery of feminists, the initial negative stereotypes plagued them and ultimately degraded the strength of the movement. In addition, the growth of media coverage concerning the Conservative movement and anti-Equal Rights Amendment activists further attacked and detracted from feminists' validity.

Poster #14/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Market Analysis Tool

Presenter(s): Noah Pashley, Josh Gleason, Nicholas DeVries, Garrett Rood

College: Technology

Advisor: Terry Burton

ABSTRACT:

A group of seniors in Computer Graphics Technologies at Purdue University in West Lafayette, Indiana was tasked to find a way that small businesses could find retailers that would be interested in selling their product. The group set out to make a program that would give small businesses a cutting edge into the market by providing them with the best area to find retailers to sell their product as well as provide them with lists of retailers that showed interest in their products.

Poster #15/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Mathematical Modeling in High School Engineering

Presenter(s): Hilde Thayer, Tanner Huffman, Nathan Mentzer

College: Technology

Advisor: Nathan Mentzer

ABSTRACT:

Mathematical modeling is an essential practice of engineering design. Students in college engineering programs and expert engineers spend time modeling in the design process. Additionally, high school technology and engineering education students spend time modeling during design challenges. While studies have found college students, experts and high school students are modeling, the National Academy of Engineering Committee on K-12 Engineering Education found that "Existing curricula do not fully exploit the natural connections between engineering and the other three STEM subjects". One of these connections, mathematical analysis and modeling, was nearly entirely absent from the curricula the committee reviewed. Modeling, as defined by the National Academy of Engineering Committee on K-12 Engineering Education, included three distinctly different types of representations which include the creation of mathematical, graphical and physical models. While research has indicated that students are spending time modeling, the types of modeling the students are performing remains unclear. The purpose of this study is to shed light on the types of modeling students are engaging in. This study aims to provide evidence about student modeling behaviors which may lead to more informed decisions about how engineering design can be used as a pedagogical strategy in science and mathematics instruction.

Poster #16/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Team Based Design Thinking in High School Engineering and Technology Classrooms

Presenter(s): Jessica Dewar, Zach McKeever

College: Technology

Advisor: Nathan Mentzer

ABSTRACT:

The purpose of this research was to explore how teams of high school students use the engineering design process as a STEM learning experience. The engineering design process is the key element of the field of technology and engineering. Engineering design has the potential to integrate science, technology and mathematics concepts for students and is essential for developing technological literacy (Katehi, Pearson, & Feder, 2009). A descriptive study was conducted spanning multiple high schools in urban, rural and suburban environments. The quantitative research method design leveraged the use of data from 17 design teams comprised of 2-4 students each from two states. Each team came from a school that has a recognized engineering program associated with an outreach effort by a university engineering program. Teams were expected to develop a solution in 2 hours. The interactions of group members were video and audio recorded while they were developing the design solution to determine their process.

Poster #17/ Humanities/ Social Science

Title of Poster: Global Policy Issues in Agriculture: Technological, Economic, and Social Implications of Livestock Confinement Systems

Presenter(s): Kelli Kirtley

College: Agriculture

Advisor: Dr. Scott Radcliffe

ABSTRACT:

Legislation aiming to set standards for the confinement of livestock animals in food production has drawn criticism from livestock producers because it may affect global food security. Producers have voiced concern that legislation dictating the standards for confinement of livestock will impede their aptitude to meet future production demands. Upon hearing about new legislative measures related to animal production, I wanted to increase my knowledge and understanding of the current policy environment and investigate the driving factors which created it. Since policy discussions are dynamic and ever-changing, information monitoring was completed by utilizing a content change detection and notification service and by establishing an online dashboard. Through extensive analysis of the current policy environment surrounding this issue, it has become apparent that several components play a crucial role in the policy discussion, including: science and technology, economics, and societal attitudes. Alternatives to current policy were discussed, but a considerable amount of debate still remains into which policy alternative provides a solution.

Poster #18/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Human Centered Design Thinking in High School: Implications for Teacher Education

Presenter(s): Lisa Beckwith, Cameron Nunan

College: Technology

Advisor: Nathan Mentzer

ABSTRACT:

The goal of this study was to understand how high school students use the Human Centered Design (HCD) process during an engineering design challenge. High school students participated in a three hour design challenge which was video and audio recorded. Data were coded in alignment with Zoltowski, Oakes and Chenoweth (2010) Human Centered Design Process. The research team coded only elements that were deemed unique to human centered design and did not code elements common to most design processes. Results indicate that students are generally not spending much time thinking about Human Centered Design. Underrepresented students spent more time engaged in Human Centered Design than their peers.

Poster #19/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Creating a hybrid paper-electronic aircraft work instruction using integrating 2D Barcode and Augmented Reality data visualization technologies

Presenter(s): Paul Lewin, Emily Thomas, Ashleigh Broyles, Seung Min Lee

College: Technology

Advisor: Tim Ropp

ABSTRACT:

Technical work instructions used by engineering technicians in aircraft maintenance, repair and overhaul (MRO) processes remain largely paper based in the industry. Technicians often encounter situations requiring additional support material, technical advice, or amplifying visual information requiring them to leave the work area to conduct additional technical data searches or seek technical support. A paper-based/electronic "hybrid" work instruction with network enabled data access via portable personal computing devices could offer the MRO industry one solution to modernizing current paper-only work instructions. As a work in progress, this project demonstrates "digital" data access and display capabilities for paper based instructions, using optical targets embedded within paper based procedural instructions. These can be scanned using light weight hand held PCD platforms (smart phone and I-Pad) and Quick Read 2D Barcode and Augmented Reality visualization technologies, delivering high end graphics, native CAD file parts information, animations or other technical data directly to the point of maintenance. This type of adaptable work instruction preserves the human operator's choice in level of detail required. The goal is to improve maintenance task efficiency and accuracy while reducing time wasted searching for additional data or obtaining technical assistance.

Poster #20/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Crane Safety: Lessons from the Nuclear Industry

Presenter(s): David Zukley

College: Technology

Advisor: Bryan Hubbard

ABSTRACT:

Fatalities and injuries involving crane operations on U.S. construction sites have not appreciably changed over the last 20 years. Incidents causing injuries and fatalities occur due to events such as crane boom contact with overhead power lines, workers struck by a crane load, and cranes collapses. Recently, a study was completed on construction crane operations on or near U.S. nuclear power plants. Safe and effective crane operation is critical for operational use and construction processes in and around active nuclear power plants. Many of the concepts and procedures developed for both operational crane use and construction at a nuclear power plant would benefit crane operations on a general construction site. To determine if some of the unique requirements for nuclear crane operation would benefit the general construction industry, a review of procedures and requirements in the nuclear industry was completed. To improve safety of crane use, it may be appropriate to turn to crane requirements that have very low probability of failure, such as in the nuclear industry.

Poster #21/ Humanities/Social Science *****

Title of Poster: Evaluating Interest in Engineering: Triggers and Causes of Changing Interest

Presenter(s): Miles Evans

College: Education

Advisor: Ronald L. Carr

ABSTRACT:

Incorporating engineering education into P-12 curricula across the country is important for reasons of increasing college engineering enrollment, technological literacy, and global competiveness (Brophy, Klein, Portsmore, & Rogers, 2008). A student's interest in engineering can affect their long-term participation in engineering subjects (NAE, 2009). A method of evaluating a student's interest in engineering is can improve the quality of engineering education by identifying the triggers of interest and including those in curricula (Prenzel, 1988). Our goal is to evaluate students' interest levels, how they perceive their own interest level, and what triggers change in student interest. Based on a sample of 207 interviews of elementary school students, we are developing a coding scheme that will translate students' answers of the interview questions to a 5-point scale indicating their interest level. This code will be based on how informed the student is, the student's emotional response to engineering, how worthwhile the student thinks engineering is, how capable the student feels he/she is in engineering, how much the student wants to do engineering, and if engineering relates to the thing subject are most interested in. These results will then be analyzed for triggers that impact a student's interest in engineering. References Brophy, S., Klein, S., Portsmore, M., & Rogers, C. (2008). Advancing engineering education in p–12 classrooms. Journal of Engineering Education, 97(3), 369–387. National Academy of Engineering and National Research Council of the National Academies. (2009). Engineering in k–12 education: Understanding the status and improving the prospects. Washington, DC: The National Academies Press. Prenzel, M. (1988). Conditions for the Persistence of Interest.

Poster #22/ Life Science

Title of Poster: Phenotypic and Developmental Variation in Bigheaded Carp Eggs

Presenter(s): Allison Lenaerts

College: Agriculture

Advisor: Reuben Goforth

ABSTRACT:

Bigheaded carp (Hypopthalmichthys spp.) are highly invasive species, characterized by high fecundity and protracted spawning that likely play a large role in their ability to invade novel ecosystems. Large egg sizes in these species are also likely to increase survival of fish embryos. Bigheaded carp eggs from the Missouri River have shown to be greater than or equal to 4 mm in diameter. However, no data have been presented to date on eggs from other populations. Our objective was to examine phenotypic and developmental variation in bigheaded carp eggs. Bigheaded carp eggs were collected from the Wabash River, Indiana, in summer 2012 using paired bongo net pulls, and were returned to the lab where they were measured and photographed. We discovered that egg diameter increased through time. The developmental stage of eggs also increased through time with high variability. Eggs collected from the Wabash River were smaller in diameter than those collected from the Missouri River.

Poster #23/ Life Science

Title of Poster: Prevalence of ranavirus across Indiana

Presenter(s): Megan Winzeler

College: Agriculture

Advisor: Rod N. Williams

ABSTRACT:

Emerging infectious diseases are responsible for significant declines in amphibian populations around the world. Ranavirus is considered a primary pathogen currently threatening amphibians, attacking the immune system of larval amphibians and causing mass die-off events across six continents. This disease can persist in populations through sub-lethal infection of adults, spreading from one site to the next through dispersal or anthropogenic disturbance. It is important for the conservation and proper management of amphibian species to determine the prevalence of this disease throughout a variety of ecosystems. Indiana has a highly fragmented landscape which can lead to higher degrees of anthropogenic disturbance and possibly a greater likelihood of ranavirus spreading throughout the state. Minnow trap arrays will be used to collect green frog (Lithobates clamitans) tadpoles at six sites covering Indiana. Tadpole livers will be used to extract DNA and PCR analysis will be performed on each individual sample. Each sample will be extracted and amplified under sterile conditions to prevent the cross-contamination of any one individual to another. Positive samples will be identified in triplicate on agarose gels run with multiple positive and negative controls. The virus has been found in Indiana but the prevalence of this disease in the state is undocumented. This study will determine the prevalence of ranavirus in green frog tadpoles at six sites across the state of Indiana.

Poster #24/ Life Science

Title of Poster: Synergistic Toxicity Assessment of Heavy Metal Tungsten Alloy Components

Presenter(s): Anna Winchester

College: Health and Human Sciences

Advisor: Jennifer L. Freeman

ABSTRACT:

Tungsten (W) is a heavy metal that was introduced as a nontoxic substitute to lead in ammunition in the mid-1990s. Recent studies suggest that W alone may have limited toxicity but there is potential synergistic toxicity when in mixtures with other heavy metals. In this study, the potential synergistic effects of W along with two components of heavy metal tungsten alloy, cobalt and nickel, were investigated in vivo in zebrafish by measuring morphological structures. An acute toxicity test was first performed for each metal with different concentrations to measure mortality rates. Zebrafish embryos were exposed to different metal treatment groups that contained each metal alone, a W/Co mixture, a W/Ni mixture, or a W/Co/Ni mixture. Measurements of the eye, head, and total body length were taken for each embryo. The average body lengths for the groups containing only W resulted in a significant decrease in length in the 10 ppt W treatment in comparison to the control group, however no significant differences were observed within the W treatment groups between the W treatment alone and the mixtures containing Co/Ni. Therefore although synergistic toxicity is reported for mortality rates, no synergistic effect was observed with these metals on morphological structures.

Poster #25/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Purdue After Class

Presenter(s): Alex Dunfee, Matthew Nieminski, John Petersen, Nowai Matthew

College: Technology

Advisor: Terry Burton

ABSTRACT:

Purdue students do not have an engaging and interactive way to learn about different ways to get involved on campus. Our product is for Purdue students who are looking to become involved with events and activities outside of the classroom within the realm of the Office of Student Affairs. The Purdue After Class website is a dynamic website that provides up to date information about the Office of Student Affairs events and the opportunities available to get involved outside of the classroom at Purdue University. Unlike Get Involved, www.getinvolved.purdue.edu, or the Office of Student Affairs website, www.purdue.edu/vpsa, Purdue After Class provides an engaging and intuitive design to bridge the gap between students and learning that can take place outside of the classroom through the Office of Student Affairs. We plan to have students compare our website design against Office of Student Affairs websites as well as perform usability testing for our website. Our overall goal is to consolidate all of the Office of Student Affairs websites into one location with an interface that is designed for students.

Poster #26/ Physical Science

Title of Poster: Forensic Meteorology

Presenter(s): Ashley Baldwin

College: Science

Advisor: Professor Jeff Trapp

ABSTRACT:

Just prior to the "Sugarland" concert on August 13th 2011, thunderstorm-driven winds caused the stage at the Indiana State Faigrounds to collapse at 8:46 p.m. Seven fatalities and fifty eight injuries resulted, and legal actions have been taken against the band and the Fairgrounds. This research, which is an example of forensic meteorology, attempts to determine if there was anything unique about this thunderstorm event that could be used to excuse blame. I approached the project by forming a timeline of events, including concert times, weather-watch times, and weather-warning times, and correlated these with NEXRAD radar data. I also looked at local storm reports and surface observations near Indianapolis. It appears the storm was expected because it moved from the northwest to the southeast. Severe thunderstorm watches and warning issued by the National Weather Service were enough in advance, and local storm reports show the storms were of no surprising approach. Severe winds exceeding 60 mph and 0.75" hail in Tippecanoe County around 7 p.m. reported well before the stage collapse shows that the storm intensity should not have been a surprise.

Poster #27/ Innovative Technology/Entrepreneurship & Design

Title of Poster: The effect of molecular surface modification on the selectivity and permeability of nanoporous membranes

Presenter(s): Munkyo Suh

College: Engineering

Advisor: John A. Howarter

ABSTRACT:

Membrane technology is being researched intensively due to its potential for generating clean water. The average pore diameter in a membrane strongly determines the selectivity and permeability. We seek to use molecular surface modification to alter the chemistry of nanoporous membranes with the goal of increasing the membrane selectivity while maintaining high water permeability. Amino-silanes were used to alter the surface chemistry; the effect of the surface treatment was tested for different membrane materials and initial pore sizes. For a polyacrylonitrile membrane the flux decreased from 0.0318 ml s-1psi-1 to 0.0275 ml s-1psi-1, while for polysulfone membranes of two different pore diameters (PS10 and PS35), the flux increased, from 0.0044 ml/s/psi to 0.0957 ml s-1psi-1 for the PS10, and 0.0283 ml s-1psi-1 to 0.1307 ml s-1psi-1 for the PS35. Contact angle measurements were performed to determine the interfacial behavior of the modified membranes. The membrane selectivity was measured using a NaCl solution; salt rejection rate was characterized based on the conductivity of the permeate solution. By changing surface chemistry but minimally altering pore size, we show that water flux and salt rejection are both impacted. The effect of surface modification is strongly determined by the membrane material and weakly determined by initial pore diameter.

Poster #28/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Expert and Novice Design Thinking Comparison: Implications for Teacher Education

Presenter(s): Craig Locker

College: Technology

Advisor: Dr. Nathan Mentzer

ABSTRACT:

The purpose of this research is to clarify engineering design as a construct and perform empirical exploratory research on engineering design as a STEM learning experience for high school students. Engineering design thinking among high school students has the transformative potential to contextualize math and science principles as they apply to creating technologies. Understanding this STEM integration is foundational to developing effective educational interventions to improve all students' understanding of our highly technological society. As high school students learn the engineering design process, they gradually internalize a methodic manner of thinking, integrating mathematics and science, which informs the central practice of engineering (Sheppard, Macatangay, Colby, & Sullivan, 2009). This project tests the reasonableness of comparing high school student engineering design thinking with that of experts and investigate the feasibility of these research methods. Results denoted a wider gap between high school students and experts than originally hypothesized. This research has begun to splinter into a multitude of methods, curriculum, and project based learning tools to aid in the advancement of high school learning in the areas of STEM integration.

Poster #29/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Information Use in Engineering Design by High School Students

Presenter(s): Craig Locker

College: Technology

Advisor: Dr. Nathan Mentzer

ABSTRACT:

This study measured the information gathering habits of high school engineering design students as they solved a design problem. The authors investigated what types of information students accessed, its quality, and whether the information gathered impacted the final design and/or the thinking of the student while solving the problem. Students overwhelmingly relied on internet searching to acquire information, rather than printed materials available to them, and the sites they found were generally popular rather than technical, and persuasive (i.e., trying to sell something) rather than informative. The high school students understood the need for information, as they sought a variety of information which they did incorporate in their designs, but their skill in locating high-quality information is still relatively poor.

Poster #31/ Innovative Technology/Entrepreneurship & Design

Title of Poster: MAGMA

Presenter(s): Thomas Gick, Peter West, Justine Vogie, Amanda Marko

College: Technology

Advisor: Burton

ABSTRACT:

For HVAC (heating, ventilation, and air conditioning) companies, technicians being trained to install new products would benefit from a training application that takes into account their learning styles. Unlike traditional instructional methods that use mostly text or diagrams, this application will incorporate multiple ways of presenting information in order to accommodate multiple learning styles which could as a result increase memory retention.

Poster #33/ Innovative Technology/Entrepreneurship & Design

Title of Poster: RAVtech

Presenter(s): Keegan Hrybyk, Brian Rosensteel, Max Do

College: Technology

Advisor: Clark Cory

ABSTRACT:

Our project is creating and defining how to make high quality architectural renderings. We chose to work on this project after speaking with the group sponsor, Scott Schroeder, who told us there is a need for a defined set of guidelines on the most efficient way to create photorealistic renderings utilizing such software as Autodesk Revit and 3D Studio Max. Just importing Revit files into Max and clicking “render” does not get you a photorealistic image. There is a lot of editing along the way, particularly the surface materials of the Revit file. In this project we are trying to figure out how best to solve these rendering issues. From our research and our experience in testing the capabilities of rendering Revit models in 3DS Max, we have discovered that another major factor in producing quality pictures is adjusting the indirect lighting. Even after adjusting all the materials and lighting (both direct and indirect) we found that you might still have to further manipulate the rendering in Photoshop to achieve the quality you desire. So far, we have decided that before you set out to make these high quality architectural renderings, you must understand the limitations of your software, and budget time to work in both Revit and 3DS Max.

Poster #34/ Humanities/Social Science

Title of Poster: Replicating and Analyzing Ancient Metallurgy Using Experimental Archaeology and Materials Science

Presenter(s): Marah Brenneman, Jenna Ling

College: Liberal Arts

Advisor: Dr. Kory Cooper

ABSTRACT:

Through replicating a copper tool utilized by the Ahtna of central Alaska, who were credited with the discovery of native copper in the Pacific Northwest, we hope to better understand the origins of metallurgy and innovation more generally. This research experiment was conducted to help determine the processes and time needed to fabricate a native copper awl using only stone tools. First, the copper nuggets were hammered into a rod-like shape using a stone hammer and anvil. Some pieces were annealed, or heated to a high temperature, in an open fire before being allowed to cool slowly or alternatively quenched in water. Samples were then taken to the lab for microstructural analysis and mechanical testing. We found that the copper was easily shaped in a matter of minutes due to its atomic structure. Some nuggets fractured or broke during the hammering process from non-metallic inclusions. Fragments such as these are often found at prehistoric copper-working sites. The continuation of this research will help shed light on the motivations and hurdles involved with changes in prehistoric technology, e.g. examining the relative efficiencies of copper, stone, and bone tool technologies.

Poster #35/ Physical Science

Title of Poster: Aircraft-based Measurements of Atmospheric Aerosol Size Distributions and Transport near Barrow, Alaska in Spring 2012

Presenter(s): Eric Boone

College: Science

Advisor: Paul Shepson

ABSTRACT:

Aerosol particles play an important role in the chemistry of the atmosphere by providing surfaces for heterogeneous reactions, contributing to radiative forcing, and forming clouds. However, knowledge of their specific chemical and physical characteristics, particularly in the Arctic, is not well understood. In the springtime, haze layers, formed from transport of anthropogenic pollution and photochemistry, are visible in the Arctic. Therefore, aircraft-based measurements of particle size and concentration were conducted in March 2012 near Barrow, Alaska. The particle diameter mode was generally 200-300nm, suggesting major contributions from Arctic haze aerosol, rather than sea spray. Background concentrations were typically ~100 particles/cm3 with enhanced layers present in the free troposphere. Modeled backward air mass trajectories were used to determine transport and possible particle sources. Air masses associated with background-level concentrations of aerosols were transported low over the Arctic sea ice. The air masses associated with the enhanced aerosol layers originated from around Russia and spent several (2-5) days in transit high over the Arctic Ocean. These results give further insights into the characteristics of the Arctic aerosols and will be used, in combination with chemistry data, to improve future models and predictive studies of atmospheric chemistry in this changing environment.

Poster #36/ Innovative Technology/Entrepreneurship & Design

Title of Poster: A Longitudinal Examination of Air Carrier Performance during 2007 through 2011

Presenter(s): Reilly Meehan

College: Technology

Advisor: Dr. Brent Bowen

ABSTRACT:

The Airline Quality Rating (AQR) was first announced in the early 1990s as an objective mechanism of measuring airline service performance based on multiple selected criteria important to air travel consumers. Since then, the AQR results have been available to assist government in decision-making as well as to help airlines identify service gaps. Initially, the national AQR reports used weighted averages and monthly performance data in the areas of on-time arrivals, involuntary denied boardings, mishandled baggage, and a combination category of customer complaints from which major airline comparative performances were reported. In order to further strengthen the significance of the AQR results and prepare the comparison of major airlines' service for aviation enthusiasts (airline managers and the flying public), this paper revisited AQR data sets and reanalyzed five previous reports (2007, 2008, 2009, 2010, 2011). Benchmarking techniques were utilized to assess airlines' AQR performance and track the comparative service quality for major U.S. airlines' domestic operations. Based on the benchmarked outcomes, an airline's operational deficiencies can be retrieved and simultaneously opens a window for service improvement and for public review.

Poster #37/ Physical Science

Title of Poster: The Effects of Thermal Annealing and Nano-Particles on the Phase Morphology of Thermoplastic Thin Film Polymers

Presenter(s): John Epling

College: Engineering

Advisor: Dr. Kendra Erk

ABSTRACT:

The correlation between the physical/chemical properties and phase morphology of poly(stryrene-ethylene/butylene-styrene) (SEBS) block copolymer thin films was investigated using Atomic Force Microscopy (AFM). These properties that the polymers exhibit in service are directly associated with the micro-structural phase distributions of the substituent polymer blocks within the copolymer. SEBS polymer Kraton G1651 was spin-coated into thin films at 5 and 7 wt% dissolved in toluene at both 2000 and 3000 rpm and analyzed using AFM under thermal annealing temperatures of 50 and 150°C and three mass percent silica nano-particle infusion conditions. The AFM provided a visual, color-coded map of how the phases within the SEBS polymer changed due to thermal annealing and nano-particle infusion. So far definitive evidential data shows a rough trend of decreasing polystyrene phase surface area from 1-3% and an increase in ethylene/butylene phase surface area during thermal annealing. This data proves how the micro-structural phases do change under heat conditions altering the properties and performance of the polymers. More research is needed to understand the effect of nano-particle infusion on the micro-structural phases of the SEBS polymer.

Poster #38/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Aviation Emissions Modeling

Presenter(s): Matthew Prall

College: Engineering

Advisor: Dr. Mary Johnson

ABSTRACT:

The purpose of this project is to explore, estimate and compare emissions at Purdue University Airport (KLAF) using the Emissions & Dispersion Modeling Software (EDMS) using standard and customized inputs. In 1998, the FAA instituted a policy that identifies EDMS as the required model to perform air quality analyses for aviation sources. EDMS generates emissions outputs and dispersion models based on user inputs, including aircraft type, number of landing take-off cycles (LTO), airport layout, weather conditions, and other inputs. Engine emission factors are taken from the International Civil Aviation Organization (ICAO) engine data bank. Customized inputs are needed because emission outputs may not be modeled accurately due to outdated engine emission factors, LTO cycle data, lack of alternative fuel emission factors, and standard modeling inputs that are not airport specific. Factors with the greatest influence on emission output can be determined by varying single parameters of the model and comparing emission output for each model generation to a baseline model.

Poster #39/ Life Science

Title of Poster: Synthetic interactions between DNA ligase mutant cdc9-1 with chromatin assembly factor CAC1 or Histone Acetyltransferase SAS2 in Saccharomyces cerevisiae

Presenter(s): Alexander Kosiak

College: Agriculture

Advisor: Dr. Ann Kirchmaier

ABSTRACT:

Proliferating Cell Nuclear Antigen (PCNA) is a homotrimeric ring protein in eukaryotes that tethers DNA polymerases δ and ε to DNA, facilitating their processivity. DNA ligase I is required for DNA replication and ligates Okazaki fragments found on the lagging strand of DNA at the replication fork. Chromatin assembly factors are important for replication- and repair-coupled chromatin assembly and are hypothesized to function in the synthesis of the lagging strand and the repair of DNA damage to the lagging strand. In this study, crosses of S. cerevisiae containing the DNA ligase mutant cdc9-1 with strains containing mutations in the chromatin assembly factor CAC1 and the Histone Acetyltransferase SAS2 were used to assess interactions between these mutants in the presence of different types of DNA damaging agents. Performing serial dilution assays allows us to assess the ability of both single and double mutants to grow in the presence of this damage relative to the wild type. This will show whether CAC1 or SAS2 are involved in lagging strand fidelity and in the same pathway as cdc9-1.

Poster #40/ Humanities/Social Science

Title of Poster: Gender Roles and Dissonance of Great War Nurses

Presenter(s): Kira Krutulis

College: Liberal Arts

Advisor: Professor Whitney Walton

ABSTRACT:

The primary writings of Anglo-American women in the medical service during the Great War of 1914-1918 demonstrate two major themes. The first is that nationalism and societal expectation of duty to country during wartime was equally distributed between the genders. According to Edwardian and Victorian tradition, men were considered to be the gender fulfilling the role of combatant during war, and women were expected to be gentle healers and nurturers. The second theme demonstrates nurses, before beginning their duties, envisioned nursing to fulfill this feminine ideal. The harsh realities of war, the militarization of medical staff, and the necessary distance from their patients created cognitive dissonance over these nurses' roles, sexuality and sense of authority that manifests itself in their diaries, letters and reflections. While this dissonance often caused emotional turmoil, the writings of the women demonstrate that female medical staff during the Great War maintained a strong sense of pride in themselves and their countries.

Poster #41/ Life Science

Title of Poster: Evaluating the Effectiveness of the Two-stage Agricultural Ditch Design Using Aquatic Invertebrates as Bioindicators

Presenter(s): Evan McCoy

College: Science

Advisor: Dr. Jeffrey Holland

ABSTRACT:

Agricultural runoff is a major pollutant and measurable detractor of water quality as far downstream as the Gulf of Mexico. A new design for agricultural drainage ditch known as the two-stage ditch utilizes a floodplain to leach agrochemicals out of the water and help isolate the agrochemicals from the water cycle. The purpose of my research was to assist and provide preliminary data for a larger and more intensive study on the effects of the two stage ditch on water quality using aquatic invertebrates as bioindicators. I utilized a subset of the data from the larger study to assess whether a correlation between higher water quality and implementation of the two-stage ditch design is likely. I used family richness and the Hilsenhoff Biotic Index to assess water quality at each site and I used the Bray-Curtis statistic to evaluate community similarity between all of the sites. My data suggests that two-stage ditches are likely to increase water quality as they contained more families of aquatic invertebrates. Also, overall community similarity shows that invertebrate community structures in two-stage ditches are measurably different than those of conventional ditch design.

Poster #42/ Physical Science

Title of Poster: Electrospinning of composite nanofibers of cellulose nanofibrils

Presenter(s): Hamsini Gopalakrishna

College: Engineering

Advisor: Prof. Jeffrey Youngblood

ABSTRACT:

Cellulose Nanofibrils (CNF) are a biodegradable renewable nanomaterial with high stiffness and strength. Electrospinning is a method to produce nano-scale fibers using an electrical field. A dispersion of CNF with polyethylene oxide (PEO) dissolved in water was electrospun to obtain composite nano-fibers. PEO regulates the viscosity and jet cohesion and is used as CNF fails to spin by itself. Ideal parameter values such as target-source distance, voltage, flow rate and concentration of PEO solution were determined to be 15 cm, 22-25kV, 1-3ml/min and 5w%. The %CNF in the fibers was maximized to improve the high modulus and strength. Solutions of varying w% CNF were electrospun to determine the optimal CNF:PEO ratios that enable fiber diameter control. CNF/PEO solutions successfully spun fibers for the fraction CNF range 0.15 – 0.92. Aligned fibers were collected on a conductive rectangular frame of aluminum foil. These fibers will be tested for mechanical properties and other characteristics such as fiber alignment, thermal properties, etc using a general area diffraction detector system x-ray diffraction and differential scanning calorimetry. The interesting properties of cellulose combined with its availability and bio-degradability may cause cellulose derived materials to be the focal point of research in the future.

Poster #43/ Life Science

Title of Poster: The effects of 3-methyladenine (3MA) and Piceatannol on Autophagy

Presenter(s): Courtney Hayes

College: Agriculture

Advisor: Dr. Kee-Hong Kim

ABSTRACT:

Obesity is currently a global health problem in America. Obesity is responsible for many other chronic diseases that are the leading causes of mortality and morbidity in the United States. Autophagy, which is a process that delivers intracellular proteins to lysosomes for an energy source and degradation, has been found to be linked to the formation and break down of lipid droplets in our bodies. The purpose of this study was to see what effect different metabolites and inhibitors have on autophagy. Various cell and treatment conditions were used with these metabolites and inhibitors on Hela cells to observe the effects they had on the LC3-II band using Western Blots and Immunofluorescence. Like many experiments, the results of this were not as expected. The metabolites and inhibitors did not have the anticipated outcome on the LC3-II band. However, this research provided data that will allow for further experimentation in this area and provided a better understanding of the role of autophagy on lipid droplet break down and formation.

Poster #44/ Life Science

Title of Poster: Crystalline Ingredients and Their Interaction with Moisture

Presenter(s): Kelsey Tenney

College: Agriculture

Advisor: Dr. Lisa Mauer

ABSTRACT:

Crystalline ingredients are widely used in foods (e.g. sugars, salts, vitamins, organic acids) and their stability upon exposure to elevated temperature or relative humidity (RH) conditions influences the quality and shelf-life of food products. Many crystalline solids undergo a first order solid-to-solution phase transformation, known as deliquescence, when exposed to increasing RH. The RH at which an ingredient deliquesces is unique to that ingredient. Storing ingredients below their deliquescence RHs (RH_0s) is important for maintaining their physical and chemical stability. Reports of ingredient RH_0 values are limited; however, water solubility parameters of ingredients are more widely available. It was hypothesized that there would be a trend between the water solubility of ingredients and their RH_os, thus the objectives of this study were to extrapolate a relationship between deliquescence points and water solubilities of a wide variety of crystalline food ingredients (33 ingredients were studied) and to further explore the relationship between water solubility and RHo within categories of ingredients with similar structures (sugars, salts, organic acids, etc.). The methods of this inquiry were based on compiling published water solubility and RHo data for the ingredients under investigation. Additional RH_o values were measured by preparing saturated solutions of each ingredient and measuring the water activity using a Decagon 4TE water activity meter. The extrapolated trend of water solubility versus RH_o had a weak correlation (r^2<0.6) when all ingredients were included, indicating a weak universal trend that more soluble ingredients had lower RH_os. When this relationship was studied within ingredient categories, such as nutritive sweeteners, much higher correlations were found (r^2 = 0.9). Higher correlations were also found when plotting solubility and RHo for a single ingredient across increasing temperatures. Understanding the relationship between solubility and deliquescence can facilitate the formulation of foods with improved storage stability, as well as give researchers information about how crystalline ingredients interact with moisture in a way that has never been fully explored.

Poster #45/ Life Science

Title of Poster: Subcellular Localization of Vaccinia Virus's K3L Protein

Presenter(s): Hannah Pizzato

College: Agriculture

Advisor: Dr. Steven Broyles

ABSTRACT:

The K3L gene found in vaccinia virus produces a protein that is believed to inhibit a protein kinase, PKR, which usually functions by preventing the translation of viral proteins in the host. In other words, K3L helps the virus survive within the host by preventing an innate immune response, the PKR pathway. This function of K3L suggests that the protein is cytoplasmic once a cell becomes infected with vaccinia virus. To test this, the localization of epitope tagged K3L was observed, which displayed the presence of the protein in the nucleus. Plasmids were then created that contained either the K3L gene or a form of the K3L gene with a mutation in a region predicted to be responsible for nuclear localization signaling. These plasmids showed that while the K3L protein normally traffics to the nucleus, the mutated K3L proteins did not. These results do not agree with the current assumptions of the protein being cytoplasmic, but rather suggest that there may be an unidentified role for K3L within the nucleus.

Poster #46/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: UV Disinfection

Presenter(s): Jiashuo Liu, Nicolas Guerr-Mondragon

College: Engineering

Advisor: Chad Jafvert

ABSTRACT:

Many people around the globe do not have access to safe drinking water. Rural schools in Colombia currently boil surface water, collected from mountain streams, as a means of disinfecting the water before drinking it. However, the resulting water can be of poor quality due to high turbidity levels, resulting in poor taste and odor. Disinfecting slow sand filtered water with UV light may be a viable and less expensive alternate disinfection method. In this project, a prototype UV reactor for disinfecting water in these schools has been constructed and tested. The light intensity in the reactor has been measured using a chemical actinometer to determine the irradiation time period required with the reaction to meet U.S. EPA and EU regulations for water disinfection. In future efforts, an Arduino system will be added to control the irradiation time and inform the user of reactor status during operation, and a new prototype will be constructed that is easier to transport and disinfects a larger volume of water.

Poster #47/ Physical Science

Title of Poster: Electromagnetically-Transduced Microresonators

Presenter(s): Adam Hunkler

College: Engineering

Advisor: Jeffrey Rhoads

ABSTRACT:

Microelectromechanical systems (MEMS) utilize the combined functionality of small scale, mechanical and electrical components for practical gain. One important subset of MEMS is resonant microsystems. These systems leverage the fact that flexible microstructures, if properly designed, can exhibit comparatively large mechanical motions in a frequency-selective fashion. By appropriately tailoring the system's electrical and/or mechanical characteristics, microresonators can be realized with rich dynamic responses (i.e. frequency responses) that can be exploited in practical applications, ranging from signal processing to sensing. While Laser Doppler Vibrometers, and related laboratory equipment, can reliably measure frequency response structure, these methods are poorly suited for use in portable, real-world system. As such, this project seeks to examine the utility of electromagnetically-transduced microresonators, which can be characterized electrically without the aid of bulky measurement electronics. Our research demonstrates that the results of electrical and mechanical characterization are highly correlated and mathematically relatable using dynamical systems theory. Understanding the correlation between these two responses is essential to the development of portable, resonant microsystems with application in magnetic field or resonant mass sensing.

Poster #48/ Life Science

Title of Poster: Mammary Clock Regulation and Function

Presenter(s): Emily Erickson

College: Agriculture

Advisor: Dr. Karen Plaut

ABSTRACT:

Most physiological processes are controlled by the circadian system, which coordinates growth, development, and metabolism. Peripheral circadian clocks are located in tissues including mammary gland. The physiological function of the mammary clock is currently unknown. We hypothesize that mammary clock is regulated by lactogenic hormones and it regulates genes important to mammary development and milk synthesis. Our objectives were to 1) Determine effects of lactogenic hormones on circadian rhythms of molecular clock genes (i.e. Clock, Bmal1, Per1) in HC-11 mouse mammary epithelial cells; and 2) Knock down CLOCK to measure effects on Per1 and cell cycle gene cyclin D1 (Ccnd1) expression and cell growth rate. Q-PCR analysis showed that lactogens induced 24h rhythms of Bmal1 and Per1 expression. HC-11 cells were transfected with shRNA plasmids with Clock sequences to reduce Clock expression, or with a negative control sequence. Q-PCR analysis revealed shClock knocked down Clock expression by 67% was associated with 70% knockdown of Per1 and a 2.3-fold induction of Ccnd1. Growth curve analysis showed doubling time of shClock transfected cells was ~21h versus ~34h in negative controls. Data support that lactogens regulate mammary clock, and that mammary clock may affect cell cycle and regulate Ccnd1.

Poster #49/ Physical Science

Title of Poster: A Study of High Latitude Warming Trends Over a Meridional Transect of Northern Canada

Presenter(s): Alyssa Hendricks

College: Science

Advisor: Ernest Agee

ABSTRACT:

Climate models used for predicting global warming trends show that high latitude regions warm faster than the middle latitudes and tropics. This study focuses on the politically sensitive area known as the Canadian Northwest Passage and its potential as a major shipping waterway in the 21st century. Three key stations across the Northwest Passage, centered across approximately 90°W, with temperature and snowfall records from the mid 1940's through 2011 were chosen to examine trends in surface temperature and snowfall. Each station shows an overall increase in surface air temperature of nearly 4°C, which is much greater than the 1°C global average warming trend. The two northernmost stations experienced delayed warming and then rapid increase in temperatures in the later decades. This implies that the higher latitude regions are capable of warming at much faster rates and in shorter periods of time. This accelerated warming trend also produced an enhancement of open-water seasonal snowfall, which extends from September through December. These types of climatic changes are expected to have significant impacts on the future of the Canadian Northwest Passage as a major transport waterway.

Poster #50/ Humanities/ Social Science

Title of Poster: “Native Son: A Crucial Socioeconomic Warning?”

Presenter(s): Tim Bolton

College: Liberal Arts

Advisor: James R. Saunders

ABSTRACT:

I, Timothy Bolton, am working alongside Professor James R. Saunders in analyzing Richard Wright's 1940 novel Native Son and the ramifications of it in Chicago, where the book is set, and other cities where violence is prominent. With the overwhelming question of gun violence in America, this project holds great relevance in assaying how the main character of the novel, Bigger Thomas, is similar to many other men his age in Chicago's South Side. We approached the book by focusing mainly on the violent crimes committed by Bigger Thomas and the motives of and reactions to them by himself and the white community of Chicago in the 1930s. We were able to conclude that since the blacks of the South Side are kept, with little opportunity, in their own Black Belt, it does not matter how much money the outstanding white community gives to them, the same black men will remain apprehensive to that white community as Bigger did. The implications of our project are that, as long as communities of races are being separated and continue to have an unequal and unfair balance of progress, we will continue to see an apprehension to those who are different from ourselves.

Poster #51/ Humanities/ Social Science

Title of Poster: Shakespeare read Sidney. Have you?

Presenter(s): Mary Adkins

College: Liberal Arts

Advisor: Dr. Charles Ross

ABSTRACT:

Sir Philip Sidney's book, The Countess of Pembroke's Arcadia, or Arcadia for short, was the most popular work of original English fiction for 200 years, and a favorite of Shakespeare's. However, Sidney's use of language and sentence structure makes the text very difficult to read and understand, so much so that it is no longer even being taught in classroom settings. We have been working to edit the grammar, word choice, sentence length, etc. in a way that stays true to Sidney's writing, but that also makes the text easier to read. Our goal is not only to produce a modern version of the text that will be readable by a general audience, but also to publish and publicize it in a way that brings Sidney back into the curriculum and into public consciousness.

Poster #52/ Physical Science

Title of Poster: Public Awareness of Severe Weather Alerts

Presenter(s): Tyler Heckstall, Victoria Gruber, Brandon Owen

College: Science

Advisor: Jeff Trapp

ABSTRACT:

For every falsely-warned severe weather event, people lose confidence and trust in their local weather warning system. This was one of the big causes of injury and loss of life during the Joplin tornado. Emergency Managers also claim that this is the main limitation to public safety. This study examined people's perceptions and overall effectiveness of current tornado siren systems. One hundred seventy-nine students and faculty members were surveyed about their knowledge and confidence in the current weather-warning system in place. Results showed that people's curiosity was increased; however, alertness and watchfulness was not. Based on the results, there is a need to utilize current technology to design a localized smartphone app for Purdue that interprets the local weather and warnings in way to make people more alert.

Poster #53/ Humanities/ Social Science

Title of Poster: Chemistry in the News: How do Scientists Write about their Research to Other Scientists and the Public?

Presenter(s): Andrew Stuffle

College: Science

Advisor: Dr. Gabriela Weaver

ABSTRACT:

Scientists' objectives when performing research include following accurate procedure, collecting feasible data, and publishing the results of the research. When the research is completed, scientists often have to decide which information is the most important to share with colleagues and publishers. This information might include an introduction, background information, collaborators, when and where the research was done, data collection, and a conclusion. Much of the information described will be technical and not common diction, therefore the best information is often broken down for editors and journalists to interpret and report the findings in an article. This interpreted information will allow the public to understand the importance and implications of the research findings without confusion. The project is interested in breaking down how the information given in research articles, press releases, and news repots is organized and interpreted through the public eye. This will allow researchers to better understand how the delivery of the information effects what information is remembered by non-experts.

Poster #54/ Life Science

Title of Poster: Contact and Seating Surfaces in Relation to Development of Pressure Sores leading to MRSA Infections in Paraplegics and other Workers with Lower Limb Disabilities

Presenter(s): Claire Tighe

College: Health and Human Sciences

Advisor: Dr. McGlothlin

ABSTRACT:

Contact and Seating Surfaces in Relation to Development of Pressure Sores Leading to MRSA Infections in Paraplegics and other Workers with Lower Limb Disabilities Tighe, C, McGlothlin, JD, School of Health Sciences, Purdue University Pressure sores are a common problem among paraplegics and others with lower limb disabilities. These pressure sores can become easily colonized with MRSA and lead to further infection and health complications. While the sores can be treated, it is difficult and it would be beneficial to develop more prevention strategies. Therefore investigating contact surfaces, specifically seating surfaces, is of interest in order to connect their relation to development of pressure sores. By comparing different cushion surfaces such as gel vs air and comparing other contact surfaces like plastic, metal, and fabric as well as looking at their effects on the skin we can determine which surface is more harmful and prone to causing pressure sores. The expectation is that air cushions are going to better prevent pressure sores than gel and surfaces that cause a great amount of friction with the skin will cause more pressure sores. From the findings of the investigation, further developing can be made in cushion technology and avoidance of certain surfaces in order to better be able to prevent pressure sores

Poster #55/ Physical Science

Title of Poster: Development of Low-Cost High-Efficiency Thermoelectric Materials

Presenter(s): Christopher Robinson

College: Engineering

Advisor: Xiulin Ruan

ABSTRACT:

The world today is facing a critical energy crisis and the search for alternative energy generation approaches is more important than ever. Thermoelectric materials can be used to generate electricity from waste heat on the basis of Seebeck effect or pump heat with consumption of electricity on the basis of Peltier effect. Increasing the efficiency of these materials means increasing the figure of merit. Bi2Te3 based alloys posses a figure of merit around 1 at room temperature, making them promising for use in thermoelectric applications. Efficiency can be increased by reducing bulk Bi2Te3 materials to nanocrystalline powders via various approaches. This increases the phonon scattering at the grain boundaries and decreases the thermal conductivity. In this work, nanocrystals with average size as small as 20 nm were obtained using ball milling. Both p-type and n-type materials were obtained through doping. Preliminary results showed significantly decreased thermal conductivities in these nanostructured materials compared to their bulk counterparts.

Poster #56/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Basic Utility Vehicle

Presenter(s): David Wilson

College: Engineering

Advisor: Dr. John Lumkes

ABSTRACT:

The Basic Utility Vehicle (BUV) Team is a multi-disciplinary group of students working with international partners to create affordable transportation for developing countries. This effort focuses on the need for a vehicle to carry food and water to villages, for quick access to medical care, as well as for use as a school bus and ambulance. The BUV Team currently partners with a NGO in Cameroon, the African Centre for Renewable Energy and Sustainable Technologies (ACREST). Through the partnership with ACREST, access to affordable transportation is provided by designing vehicles that can be locally manufactured and maintained, thus providing both long term employment and service. The project is focused on taking a systems approach, including vehicle design, manufacturing, economic analysis, and marketing. A successful micro factory design will be integral to improving the economy and resources of the area. During the academic year the students work on the design of the vehicle, including the frame, suspension, controls, and driveline. The team of students has included students from colleges of agriculture, engineering, and technology, who have all benefited from the global and societal aspects of an international service learning project.

Poster #57/ Physical Science

Title of Poster: Femtosecond Laser-Produced Periodic Nanostructures

Presenter(s): Matthew Polek

College: Engineering

Advisor: Professor Sivanandan S. Harilal

ABSTRACT:

In the semiconductor industry, photolithography is commonly used in order to produce nanoscale features on various devices. However, feature sizes are typically limited by the size of the wavelength used to produce them. Recently, studies have shown the development of sub-wavelength periodic structures on various materials through interference between surface plasmons and incoming radiation from a femtosecond laser. The size of the periodic structures is highly dependent on the laser wavelength, refractive index, and ambient medium as well as weakly dependent on the laser fluence, pulse frequency, and number of shots. Though many theories have been proposed in order to explain the size of the nanostructures, such as refractive index change, grating coupling, and nanoplasma formation, the exact formation mechanisms are still poorly understood. We investigated the relation between the nanostructure size and the properties of the material based on our laboratory experiments as well as results from the literature. For generating periodic structures, 800 nm, 40 fs radiation from a Ti: Sapphire laser was focused on to various targets.

Poster #58/ Physical Science

Title of Poster: Heat Mapping of Supercapacitors

Presenter(s): Kaitlyn Fisher

College: Engineering

Advisor: Timothy S. Fisher

ABSTRACT:

Heat Mapping of Supercapacitors Kaitlyn Fisher, Guoping Xiong, Tim S. Fisher There is a growing need for rechargeable micro-power sources in miniature devices. The high energy density of electrochemical micro-supercapacitors makes them a perfect candidate for these applications. Very little is known about how the use of state-of-the-art graphene-based electrodes affects such devices. These capacitors are made by growing graphene sheets in a microwave plasma chemical vapor depositor, then shaping the sheets into an interdigitated configuration and finally covering it with an electrolyte, creating pseudocapacitance. It will soon become vital to know how heat is generated by these capacitors. This can be explored by creating a heat map of the capacitors as they charge and discharge. This study will use high resolution thermoreflectance equipment to create such a map. These will then be compared against computer generated solutions created using PSPICE circuit simulator and ANSYS FLUENT flow modeling software. The results from these experiments will be among the first in the field to begin to answer questions about heat generation in electrochemical micro-supercapacitors.

Poster #59/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Cross-linked Polyamide Thin Film Isolation of Reverse Osmosis Membranes

Presenter(s): Michael Brant

College: Engineering

Advisor: Professor John A. Howarter

ABSTRACT:

Three component Reverse Osmosis membrane systems consist of a crosslinked polyamide film, dictating desalination performance, and two microporous polymer based layers for structural support. Designing an improved membrane begins with characterizing the polyamide film's chemical structure to property relationships, tested at the nanoscale. Accurate performance testing requires a chemically variant support structure to hold an isolated polyamide film. If the isolated polyamide film can be transferred to a testable support structure the structure to property relationships can be measured. Chemical linkage between support structure and polyamide film was studied. (3-Aminopropyl)triethoxysilane (APTES) was analyzed in functionalizing hydroxyl groups supplied by silicon wafer backing. 1,3,5-Benzenetricarbonyl trichloride (TMC) was examined as the connection between APTES and polyamide film. The thin film transfer method is measured with Optical Microscopy and Fourier Transform Infrared Spectroscopy.

Poster #60/ Mathematical/ Computational Science

Title of Poster: Designing the Distributed User Interface: Case Studies on Building Distributed Applications

Presenter(s): Eli Fisher

College: Engineering

Advisor: Dr. Niklas Elmqvist

ABSTRACT:

A distributed user interface (DUI) is a user interface which can allows collaboration across many devices with many users simultaneously. These devices are finding themselves more practical to use in many collaborative situations. As computational technology has become more diverse there are more scenarios where DUIs can be implemented. DUIs should not require more work than designing a normal non-distributed interface. In practice, however, DUI development is fraught with several technical challenges such as synchronization, resource management, and data transfer. In this poster we present three case studies on building distributed user interface applications: SHARD, a distributed media player for multiple displays and controls, a collaborative search system integrating a tabletop and mobile devices, and a multiplayer Tetris game for multi-surface use. From these studies we can derive general challenges for DUI development in terms of design, architecture, and implementation. With the challenges derived from these case studies we can design some general guidelines for practical DUI application development.

Poster #61/ Mathematics/ Computational Science

Title of Poster: A simple adjustment to account for proportional measurement error in linear regression

Presenter(s): Ziqi Zhou

College: Science

Advisor: Bruce A. Craig

ABSTRACT:

Measurement error is a major issue in regression analysis. If ignored, it can significantly bias parameter estimates and predictions. In the literature, there is extensive discussion regarding the situation when measurement error is constant and very little when measurement error is proportional to the regressor X. This type of measurement error occurs in practice quite often and will result in the selection of an incorrect model if ignored (Schinckel, et al., 2007). This study focuses on comparing several adjustment methods that reduce the biases and frequency of choosing the wrong model when proportional errors exist. All the methods considered adjust the regressor X before fitting Y versus X. Through a simulation study, it turns out that one method, which generalizes an adjustment used in the constant variance situation, to be easy to implement and quite robust over a large range of proportionality constants. This method is strongly recommended in cases where measurement errors of this type occur.

Poster #62/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Mobile Augmented Reality Games in Education

Presenter(s): Colin Stearns, Hyung-Kyu Kim, Joe Gnilka, Jason Baile

College: Technology

Advisor: Terry Burton

ABSTRACT:

Augmented Reality on mobile devices is an emerging technology which has exciting opportunities in areas such as marketing, gaming, and education. Currently, there has been limited research into mobile augmented reality and its relation to education. Mirage Interactive is seeking to explore how augmented reality can be applied to mobile educational games and what effect it will have on the game's ability to teach new concepts. Research is currently ongoing. This leads to the question: How can applying augmented reality to a virtual educational game effect the game's ability to teach new concepts? Using a qualitative research method, this study aims to validate using Augmented Reality as a possible teaching method.

Poster #63/ Life Science

Title of Poster: Re-connection with Nature: Re-shaping a Campus Landscape into an Ecologically Sound Campus for the Future

Presenter(s): Camille Mahan, Lana Merrill

College: Agriculture

Advisor: Paul Siciliano

ABSTRACT:

Evidence that human activities influence the global climate continues to accumulate. Scientific researchers have concluded that we must take immediate action in order to prevent serious consequences in the future. As a major contributor to the values, health, and well-being of society, universities have a responsibility for shaping a sustainable future on their campuses. A student group has undertaken a comprehensive design study to guide the development of Purdue's campus landscape. The proposal seeks to preserve the unique value and character of the campus landscape while lessening its environmental imprint. The structure and hierarchy of Purdue's landscape is composed of many interconnected spaces. An understanding of this structure is necessary to create new places and sustainable landscapes that preserve the identity of the university while connecting and supporting existing places. Specific objectives are chosen in areas where the university can significantly reduce Purdue's environmental impact. Goals of the students' plan are achieved by evaluating the basic elements of landscape architecture—planting, water, and paving when making design decisions. These elements are the key components of this plan for a self-sustaining landscape that strives to reconnect people with their environment and awaken them to the beauty of nature surrounding them.

Poster #64/ Physical Science

Title of Poster: Optical detection of synthetic molecular motors that transport nanoparticle cargos along carbon nanotubes

Presenter(s): Heather Robinson

College: Engineering

Advisor: Dr. Jong Hyun Choi

ABSTRACT:

The complex energy conversion and movement mechanisms rendered by cell protein motors have motivated scientists and engineers to construct nano-scale motors that imitate these cellular functions. DNA enzyme-based motors have been developed to transport nanoparticle “cargo” along RNA decorated single-walled carbon nanotubes. This research uses 10-23 DNAzyme and nanocrystals to demonstrate the movement of synthetic motors and investigate the kinetics of the reactions involved in the autonomous, processive walking of DNA motors using a simple kinetic model for a single turnover reactions; particularly, the effects of temperature, pH, cation identity, and cation concentration on the translocation velocity of DNAzyme-based motors are examined. The motor translocation was optically detected in real time using the fluorescence of nanocrystals and single-walled carbon nanotubes. As temperature, pH, and cation concentrations were increased, the motor translocation velocity increased for all variables. Also, Mg2+ produced the highest translocation velocity compared to values for Ca2+ and K+ under similar conditions. A maximum speed of roughly 0.1 nm sec-1 was obtained, which is three orders of magnitude slower than natural kinesin protein motors. An exploration into DNAzyme catalytic core types, length of recognition arms, and single-molecule motor activities will be performed to improve nanomotor motility.

Poster #65/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Ozone Disinfection for Water in Rural Colombia

Presenter(s): Dianne Kaminsky, Kelsey Hunter, Clint Pflum

College: Engineering

Advisor: Chad Jafvert, John Howarter

ABSTRACT:

Many people, especially those living in developing countries, do not have access to a reliable source of safe drinking water. In order to improve the quality of drinking water in rural schools near Barbosa, Colombia, a Purdue Global Design Team has designed and installed slow sand filters in 15 schools. While these filters are effective at reducing turbidity and improving odor and taste, pathogens may persist in the water after filtration. To inactivate these disease-causing organisms and make it safe for human consumption, disinfection is required. Because ozone is very effective at inactivating Giardia lamblia, (a common pathogen in Colombia) we have designed and tested a point-of-use ozone generator for disinfection. The generator produces ozone through a corona discharge. The gas phase concentration of ozone produced by the generator at a gas flow rate of 2 L/min was measured at 45 mg/L using an ozone monitor. Using this concentration and the Henry's law constant for ozone, a theoretical aqueous ozone concentration was calculated at 0.025 mg/L. This compares favorably to the aqueous ozone concentration of 0.021 mg/L measured experimentally by the indigo colorimetric method. At this concentration, to achieve the U.S. EPA requirement of 2 log inactivation of Giardia Lamblia, a contact time of 15 min is required. Considering the time necessary to reach a stable aqueous ozone concentration, a treatment time of 25 min is suggested, and can easily be achieved on batch volumes of slow sand filtered water.

Poster #66/ Innovative Technology/Entrepreneurship & Design

Title of Poster: The NeurD: A Quantitative Tool to Detect the Progression of Peripheral Neuropathy

Presenter(s): Thomas McNamara

College: Engineering

Advisor: Dr. Ann Rundell

ABSTRACT:

There is a need for a quantitative tool, for use in a clinical setting, to monitor and detect progression of peripheral neuropathy (PN), which is the loss of peripheral nerve activity. Peripheral neuropathy is a highly complex disease, with most of the cases resulting from chemotherapy and diabetes. Patients that present with sensory-motor neuropathy will experience tingling or pain of the limbs (usually starting in the feet) and will have difficulties performing tasks involving fine motor skills. In most of these cases, the disease starts out as reversible condition, and when not detected early enough, it causes irreversible nerve damage. Current solutions are customarily qualitative, with available quantitative solutions being both lengthy and invasive. The NeurD tracks the progression of a patient's neuropathy over time using three methods of data collection: electromyography (electrode voltage measurement of skeletal muscle electrical activity), sudomotor function (electrode voltage measurement of sweat quantity), and strain gauge use (voltage measurement of stretch resistance change from ankle reflex). An analytical computer program analyzes the voltage output for each testing method and graphically displays these trends over time to illustrate disease progression, which allows physicians to establish a patient treatment plan and monitor progression of the patient's disease.

Poster #67/ Life Science

Title of Poster: Age-Related Changes in Neuronal Expression of GAD 65/67 in the Rat Inferior Colliculus

Presenter(s): Anna McCullough

College: Science

Advisor: Dr. Stephanie Gardner

ABSTRACT:

Presbycusis, or age-related hearing loss resulting in difficulties in processing sound at high frequencies, is linked to physiological changes in the central auditory pathway. One change could be occurring via neuronal inhibition, which is essential in sharpening auditory responses to complex sounds. Previous studies have shown that GAD, the enzyme that converts glutamate into an inhibitory neurotransmitter GABA, protein concentration decreases in aged animal models. It is hypothesized that there will be a decreased amount of GAD+ neurons in aged inferior colliculi, specifically a decrease in the ventral region, or high frequency detecting area. Two brains, one young and one aged, were sectioned and stained for NeuN, which labels neuronal bodies, and GAD 65/67, which labels the enzyme GAD such that GAD+ neurons can be detected. Images were taken and analyzed using ImageJ to obtain the total cell count and total cell sizes as well as specifically for GAD+ cell counts and sizes. Results were compared across age and region of interest and indicate a decrease in the total number of GAD+ neurons in the aged model. Further understanding of the physiological changes that occur during hearing loss will enable the creation of effective treatments.

Poster #68/ Physical Science

Title of Poster: The Efficacy of ZUMBA® as a Stress Reliever to Improve the Mental and Physical Health of College Students

Presenter(s): Karen Ma

College: Health and Human Sciences

Advisor: Dr. James McGlothlin

ABSTRACT:

An overwhelming amount of stress is placed on college students today. Many students turn to harmful substances or behaviors instead of a healthy alternative: exercise in the form of dance. Several past studies have recognized the efficacy of dance as stress therapy, specifically ballroom and tango. A new form of dance, ZUMBA®, has been developed. However, the effects of ZUMBA® on relieving stress have not been researched. This study will implement three features to examine the efficacy of ZUMBA®: 1) Three participants video recorded and synchronized with measured heart rates into a single vignette during 3 Purdue ZUMBA® classes, 2) Saliva samples taken before and after 1 ZUMBA® class to measure cortisol levels, reflecting stress level, and 3) Qualtrics questionnaire to evaluate demographics, behavior and stress of participants before and after the 3 classes. The questionnaire found that, of 127 responses, 127 were female, 15 consume alcohol weekly, 86 exercise 2-5 times a week, 80 experience anxiety, 61 experience tension, and 39 experience depression. While the video and saliva samples have not yet been taken, this study hopes to see a reduction in stress after the 3 ZUMBA® classes.

Poster #69/ Humanities/ Social Science

Title of Poster: Social Dynamics of Captive Western Lowland Gorilla Females

Presenter(s): Jenna Beltrano

College: Liberal Arts

Advisor: Dr. Melissa Remis

ABSTRACT:

Studies on western lowland gorilla social dynamics have examined how individuals within a group are influenced by external factors such as age, housing, individual relatedness, and rearing styles. The current study examines the behavior of western lowland females at the Lincoln Park Zoo and assesses the usefulness of published methods for studying social dynamics. This study investigates the effects of relatedness, aging, and rearing history on the behavior of the females housed at Lincoln Park Zoo. The primary investigator collected behavioral data using an ethogram originally published by Stoinski (2004). Focal animal sampling of inter-individual proximity was conducted on each of the five females along with continuous sampling of all social behaviors, including affiliative and agonistic encounters and dominance behaviors. This study serves to either support or challenge the findings of Stoinski (2004) on the social dynamics of western lowland gorillas living in all-males groups. The preliminary result of this study are comparable to the findings of Stoinski (2004) and suggest that captive western lowland gorilla females who do not live in all-male group compositions also exhibit dominant relationships, variability of social interactions based on age, and group cohesion.

Poster #70/ Life Science

Title of Poster: Impacts of suckling singletons versus twins on ewes' circadian rhythms

Presenter(s): Ben Schmitt, Lucia Povinelli

College: Agriculture

Advisor: Dr. Karen Plaut

ABSTRACT:

Circadian rhythms are 24h cycles of physiology and behavior that evolved for adaptation to changes in environment and physiological state. We hypothesize circadian rhythms adjust to metabolic demands of lactation. Our objective was to determine if circadian rhythms of behavior, body temperature, cortisol, and milk composition were different between ewes suckling twins and singletons. Two groups of ewes (n=5 ewes/group) suckling singleton or twin lambs were acclimated to sampling protocol 5d beginning 7±1d postpartum. After acclimation, behavior was measured (i.e. suckling, eating, drinking, lying down) every 10 min over 24h. During the following 24h period, milk, saliva, and rectal temperature were collected every 4h. Milk composition was measured by commercial lab; saliva cortisol levels were measured with ELISA. Singleton (4.1±1.1kg) and twin (5.2±1.2kg) lamb weight and ewe body condition score (BCS: 2.8±0.2 and 2.7±0.2, respectively) were not different ($P>0.05$) at birth. At ~12d postpartum singleton (9.5±2.6kg) and twin (8.2±1.5kg) lamb weight and ewe BCS (2.9±0.2 and 2.8±0.2, respectively) were not different. However, net weight of offspring was greater in twin (15.5±2.3kg) than singleton (9.5±2.6kg; $P<0.05$) group, supporting higher metabolic demand of twin suckling. Effect of lamb number on rhythms will be determined with ANOVA.

Poster #71/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Probe Measuring Internal Ovality and Drift for Steel Pipe

Presenter(s): Spenser Souerdike, Mitchell Bruhn, Layne Carrington

College: Technology

Advisor: Phillip Sanger

ABSTRACT:

US Steel is a company that aims to be the superior producer in steel manufacturing. One of their manufactured products is a pipe that ranges from 28” to 42” in length and has an inside diameter of 2.192” and 3.255”, which is used in oil and gas production. The overall goal of this project is to design and build a measurement device that measures the internal ovality and straightness of these types of pipe, in accordance with standards set by the American Petroleum Institute. The measurement device determines, with a 20 second cycle time, if the pipe passes or fails the internal ovality and straightness tests within the given specifications. This solution is a Confocal white light measurement system with accuracy of up to one micron. Eight azimuthal measurements are taken of the internal perimeter along three axial locations of the measurement device. After measurement, the data is analyzed and generates a best fit calculation for an ellipse. The resulting eccentricity is be used to determine if the pipe is within the specifications set by US Steel. This measurement device not only provides a more advanced way to complete the task at hand, but also allows for data for feedback.

Poster #72/ Physical Science

Title of Poster: Effectiveness of a Biowall at Improving Indoor Air Quality in a Net Zero Energy Home

Presenter(s): Ian Hahus

College: Engineering

Advisor: Bill Hutzel

ABSTRACT:

While traditional heating, ventilation, and air conditioning (HVAC) systems are effective at improving indoor air quality (IAQ), the energy cost of conditioning outside air brought into the house may be undesirable in a net-zero energy home. Previous research indicates that a Biowall may be an adequate solution to this problem. A Biowall is a botanical air filter integrated into the HVAC system of a residential building. It is hoped that the Biowall system can improve IAQ while potentially saving energy when compared to traditional mechanical ventilation systems. The goal of the study is to assess the ventilation efficiency of the system, the results captured, and possible implications from this research. To test the efficacy of this system, sensors monitoring several indicators of air quality were placed up- and downstream of the Biowall. Promising results indicate that the Biowall effectively improves air quality by reducing levels of carbon dioxide and volatile organic compounds. Future efforts will be in conducting a comprehensive study on the energy consumption of the Biowall system relative to traditional systems, providing a Biowall that improves indoor air quality and reduces energy required for ventilation.

Poster #73/ Life Science

Title of Poster: Presence of Radioactive Radon Gas on Purdue University Campus

Presenter(s): Isha Kaul

College: Health and Human Sciences

Advisor: Dr. Jennifer Freeman

ABSTRACT:

Radon-222 is a radioactive gas found nearly everywhere on the planet. It is a daughter nuclide of Radium-226, and will itself continue to undergo alpha decay to form other radioactive species. Radon can be harmful to human health if inhaled, as the particles will then undergo radioactive decay and deposit energy within sensitive lung tissues. Radon has been strongly associated with lung cancer, and is thought to be responsible for roughly 20,000 lung cancer deaths per year. A field-project was designed to perform radon screening by using the PYLON MODEL AB-5/AB-5R Portable Radon Monitor and the PYLON MODEL 300A Scintillation Cells as our means of measuring the concentrations of radon gas in the air at four locations on the Purdue campus. Our results showed varying degrees of radon levels on campus—one result surpassed the EPA recommended limit of 4 picocuries per liter. Since the radon levels were acquired over short intervals, we concluded that follow-up action should be taken in the area, with a radon monitor placed to determine the long-term average value of radon concentration. We also determined that radon sampling should be performed in other buildings on campus.

Poster #74/ Life Science

Title of Poster: Development of micro-electrocorticographic stimulation of the rat auditory cortex

Presenter(s): Max Youngs

College: Engineering

Advisor: Dr. Kevin Otto

ABSTRACT:

Electrical stimulation of the brain is a promising method for the treatment of blind, paralyzed, and deaf patients. In order to achieve significant clinical success further investigation is required to gain a better understanding of the effect of the parameters of stimulation. This study explored the efficacy of stimulation of the rat auditory cortex by micro-electrocorticography (µECoG), an array of microelectrodes, which sits on the surface of the brain. To do so, a new surgical procedure was developed to implant the electrode. Impedance and cyclic voltammetry (CV) measurements were also taken before surgery and throughout the duration of the study to investigate the functionality and stability of the array. In addition, a behavioral experiment was performed to determine the rat's detection threshold by measuring the electrical stimulation delivered through the array. The electrochemical impedance was found to have an inverse relationship to the cyclic voltammetry measurements. The charge carrying capacity increased linearly as the impedance decreased for a short period post-implantation and then remained stable. Detection threshold levels were found to plateau after an initial period of decreasing. These findings suggest that µECoG arrays can be successfully implanted in the rat auditory cortex in order to perform future studies.

Poster #75/ Physical Science

Title of Poster: Designing experimental protocols to evaluate in-vitro mechanical properties of Gaviscon alginate rafts with rheology

Presenter(s): Kathleen Steckbeck, Brooke Elliott

College: Engineering

Advisor: Professor Kendra Erk

ABSTRACT:

Gastroesophageal reflux disease (GERD) is a chronic disease shown in clinical studies to affect 20% of the population on a weekly basis with symptoms of heartburn and acid reflux. The goal of this research is to develop a methodology for characterizing the mechanical properties of Gaviscon®, an acid reflux relief medication that forms a floating 'raft' to physically block acid reflux. Compared to the empirical testing on which the product development is typically based, systematic in-vitro raft formation and parallel-plate oscillatory rheometry were used here to more accurately characterize the mechanical properties of Gaviscon®. Results from this in-vitro methodology at 37°C were used to compare the mechanical properties of Gaviscon® at varying acidity of formation and evaluate trends in the mechanical properties as the rafts age in the stomach. Oscillatory results on rafts formed in the pH range of 1-2, representing the stomach, showed a 13-fold increase in strength with decreasing pH. Aging study results indicated over 100% increase in strength of the raft in a comparison of 2 to 0.5 hours in the acid solution. Research outcomes could be utilized by the manufacturer to accurately model the response of the mechanical properties to formulation changes in future product improvement.

Poster #76/ Life Science

Title of Poster: Report of fixed cell staining result of FITC-Galacto-RGD_2 in 5 cell lines

Presenter(s): Thomas Freije

College: Health and Human Sciences

Advisor: Dr. Shuang Liu

ABSTRACT:

Integrin $\alpha_v\beta_3$ is expressed in higher amounts in the membranes of certain cancer cells and in tumor vasculature resulting from tumor angiogenesis. This report highlights the differential expression levels of integrin $\alpha_v\beta_3$ in U87MG, MDA-MB-435, A549, HT-29, and PC-3 cells through differences in intensities of fluorescence following incubation with FITC-Galacto-RGD_2 or anti-integrin αvβ3 monoclonal antibody for 1 hour at room temperature. In addition, comparative binding affinities and specificities of FITC-Galacto-RGD_2 and anti-integrin αvβ3 monoclonal antibody to Integrin $\alpha_v\beta_3$ are estimated through differential fluorescence levels following coincubation and fluorescence overlaps respectively. All cell lines were fixed with -20°degree pre-cold acetone for 5 min. Fixed cell staining with the monoclonal antibody and FITC-Galacto- RGD_2 indicates that, in order of decreasing expression levels of Integrin $\alpha_v\beta_3$, U87MG, MDA-MB-435, A549, HT-29, and PC-3 cells bind to both compounds. Comparative fluorescence intensities produced by the monoclonal antibody and FITC-Galacto-RGD_2 following coincubation indicate nearly equal Integrin $\alpha_v\beta_3$ binding affinities. In addition, fluorescence overlaps produced through coincubation indicated very similar binding specificities for the two compounds. These results indicate that RGD peptides, as cheap and easy-to-synthesize molecules, may be diagnostically advantageous compared to the anti-integrin αvβ3 monoclonal antibody.

Poster #77/ Physical Science

Title of Poster: To Shine or Not to Shine? Investigation of De-Excitation Dynamics in 3-cyano-6-hydroxycoumarin Photoacid with Ab-Initio Calculations

Presenter(s): SungMin Hong

College: Science

Advisor: Lyudmila Slipchenko

ABSTRACT:

Photoacids act as strong acids or even superacids in the electronically excited states and can increase local acidity in a controllable way. However, dynamics of the excited state proton transfer in photoacids is complex and often non-adiabatic. For example, ultrafast transient absorption spectra of 3-cyano-6-hydroxycoumarin (CHCM) indicate a significant fraction of electronically excited molecules experience rapid (<1 ps) radiationless decay to the anionic ground state. This work uses *ab initio* quantum chemical calculations to investigate dynamics of excited state proton transfer in CHCM and identify non-adiabatic pathways that return this chromophore to the ground state upon proton transfer. The excited states of CHCM are described with equation of motion coupled cluster (EOM-CC) and time-dependent density functional theory (TD-DFT) methods. The interaction between the chromophore and solvent is modeled using two methods: effective fragment potential (EFP) and polarizable continuum model (PCM). EFP provides a rigorous description of solvent degrees of freedom while PCM is a computationally efficient but less accurate way to represent the solvent environment. The electronic excited states along the proton-transfer-to-solvent coordinate are used to characterize interactions between the electronic states in CHCM and predict non-adiabatic or adiabatic dynamics in other photoacids.

Poster #78/ Physical Science

Title of Poster: An Assessment of Climate Change Impacts on the USA Corn Belt Region

Presenter(s): Samuel Childs

College: Science

Advisor: Dr. Ernest Agee

ABSTRACT:

The United States is the world's largest producer of corn. Thus, it is imperative that farmers be able to effectively respond to climate change. This study examines the effects of climate change on corn production in the USA Corn Belt region for the period 1960-2012. Temperature, precipitation, and length of growing season trends show increases of 0.78^{o}F, 9 days, and 2.06 inches respectively through the period. Along with technology advancements, these climate trends support the observed increase of 1.7 bushels per acre per year. Corn yield increases also suggest a geographical shift in the Corn Belt toward the northwest. Further, a conceptual model is introduced to delineate years of extremely poor corn yields. This model contains an Upper Bound based on technology advancements, and a Lower Bound, defined as the difference between the mean production and the Upper Bound. Values falling below the Lower Bound are classified as extremely poor yields due to adverse weather/climate events. The model is tested for two counties (Tippecanoe County Indiana and Webster County Iowa), as well as the entire Corn Belt. Extreme weather/climate criteria, such as drought, Excessive Heat Degrees, and reduced growing season length, are analyzed to show their contributions to poor yields.

Poster #79/ Life Science

Title of Poster: Application of kinetic criteria to define lameness in individual dogs

Presenter(s): Morgan Elmore

College: Agriculture

Advisor: Dr. Gert Breur

ABSTRACT:

Application of kinetic criteria to define lameness in individual dogs Elmore M, Weng H-Y, Kazmierczak KA, Breur GJ. Purdue University College of Veterinary Medicine, West Lafayette, IN Instrumented gait analysis is used to study the movement of dogs with a gait abnormality. It is an objective way to evaluate gait and can provide information on recovery as well as aid with diagnosis of abnormalities. Recently, normal ranges for kinetic variables were established, but they have not been used for detection of lameness. The objective of this study was to test the hypothesis that dogs with lameness have kinetic variables (KVs) outside the normal ranges. Twenty-eight adult dogs suffering from unilateral cruciate ligament rupture were included in this study. KVs were measured using a pressure sensing walkway. Data were analyzed using commercial and custom made software. The peak vertical force symmetry indices (PVF-SI) of the pelvic limbs were above normal in 25 dogs and below the normal range in the thoracic limbs of 11 dogs. Twenty-five dogs had a weight distribution of the affected pelvic limb that was below normal. This study shows that gait analysis may be an effective and objective way of defining canine lameness.

Poster #80/ Humanities/Social Science

Title of Poster: Comparative analysis of engineering identity between genders at the 4th grade level

Presenter(s): Brittany Mihalec-Adkins, Bailey Mantha-Nagrant, Pragna Shashidhar

College: Health and Human Sciences

Advisor: Dr. K. Anna Douglas

ABSTRACT:

Nationally, there is a consistent discrepancy between male and female students' interests in engineering within middle school, high school, and college age groups. The purpose of this study was to explore whether gender differences could be found in 4th grade students' engineering identity development prior to and after one school-year where engineering was integrated into classrooms (n=67). Students took surveys of the Engineering Identity Development Scale (EIDS) (Capobianco, Diefes-Dux, & Habashi, 2009) at the start and end of the academic year. Differences in responses between genders were analyzed through MANOVA and MANCOVA with the expectation that female students would have lower mean scores in the factors of EIDS, compared to their male counterparts. Results revealed no significant differences between genders on their initial EIDS scores or in levels of gain after learning about engineering in classes. These findings suggest that males and females in 4th grade have similar levels of identification with engineering and that gender-based differences may be developed later in life.

Poster #81/ Life Science

Title of Poster: 15-Methylene-Eburnamonine: A Natural Preventative Agent of Cancer Stem Cells in Multiple Myeloma

Presenter(s): Melissa O'Banion

College: Science

Advisor: Julia Kirshner

ABSTRACT:

Multiple myeloma is a cancer of bone marrow plasma that accounts for 13% of all blood malignancies. Treatments can increase the five year survival rate of diagnosed patients, but the relapse rate is nearly 100%. Treatment complications include increased resistance of myeloma cells to therapeutic drugs throughout disease progression and cancer stem cell presence in tumors, an inherently drug-resistant population of tumor cells with the capacity to drive tumor growth and relapse. Prevention has stronger implications since current treatments cannot eliminate cancer stem cells. A successful preventative agent would exhibit specificity for multiple myeloma cell types and cancer stem cells while remaining non-toxic in normal tissues. A plant derived natural product, eburnamonine (EBN), as well as its derivative, 15- methylene-eburnamonine (15-M-EBN), were investigated as potential myeloma preventative agents. EBN is derived from the plant Periwinkle and has been shown to induce moderate cell death in multiple myeloma cell types KMS-12-BM, U266, and RPMI-8226 cells. The 15-M-EBN derivative exhibits more cytotoxicity against these three cell types and doesn't kill normal cells. 15-M-EBN not only kills primary tumor cells, but also eliminates the cancer stem cells. Therefore, 15-M-EBN meets the criteria for a potential agent to prevent the relapse of multiple myeloma.

Poster #82/ Life Science

Title of Poster: Distribution modeling for the eastern red bat (Lasiurus borealis) using MaxEnt

Presenter(s): Rachel Vanausdall

College: Agriculture

Advisor: Patrick A. Zollner

ABSTRACT:

Given the ecological functions of bats, consideration of habitat suitable for their survival is becoming common. The eastern red bat is a foliage-roosting bat common in the eastern U.S. It is one of the bat species killed most often by wind turbines. Red bats generally require forest habitat for roosting and foraging, so they may be affected by forest management practices, as well. We conducted 30 mobile acoustic surveys at 13 Indiana state forests to obtain locations of L. borealis and used 10 environmental variables to measure probability of habitat suitability. We also compared two bat call identification software, BCID10 and Echoclass. The locations of identified red bat calls were used as input for a species distribution modeling program, MaxEnt. MaxEnt can be a useful tool for quantifying the impacts of different variables on habitat suitability. It uses presence-only data and environmental variables to predict the probability of habitat suitability in a given area. The variables with the most important effects on red bat habitat suitability were proportion of hardwood forest and proportion of streams. These output maps may be important for assessing the impacts of different forest management scenarios and of future wind energy developments on red bat habitat.

Poster #83/ Life Science

Title of Poster: Using camera traps to infer influences on capture probability of Peromyscus

Presenter(s): Christina Bienz

College: Agriculture

Advisor: Dr. Patrick Zollner

ABSTRACT:

Trap avoidance or an increased affinity can lead to bias in population dynamic estimates which are fundamental components to numerous scientific studies. Avoidance and affinity behaviors could be induced by factors such as odor. However, there is a lack of information concerning the impacts that odors of previously captured Peromyscus have on trapping success of the next individual. Live Sherman trapping for Peromyscus was conducted using a reciprocal translocation of traps between two trapping grids approximately 1.6 km apart to ensure unfamiliarity of trap scents during the spring and fall of 2012. Camera traps were placed at each translocated trap during the fall of 2012 as well as traps that had not been replaced with unfamiliar smells to record amounts of visitation for each treatment. We recorded camera trap visitations by species for each night. A logistic regression only including live trapping data could indicate that Peromyscus actively avoid traps with unfamiliar scents. However, when camera covariates are included, Peromyscus could be investigating traps with unfamiliar scents more frequently than detected by live trapping methods. Therefore, the presence of unfamiliar odors in traps must be considered by researchers when moving traps to subsequent locations.

Poster #84/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Mobile Virtual Reality Comparison

Presenter(s): Daniel Powell, Grant Herring, Jake Hellman, Michael Zumbrun

College: Technology

Advisor: George Takahashi

ABSTRACT:

The use of immersive virtual reality systems in both industrial and academic fields for product visualization and out-of-field training is a growing trend. Immersive virtual reality systems can be very expensive and are more often than not physically confined to a single room. Using commercially available and affordable parts the Envision Center at Purdue has put together a mobile virtual reality system that is intended to mimic the features of the immersive virtual reality system. We are currently working on a comparative usability study between the two separate systems. In order to conduct this study we are currently in the process of developing a simulation for depth-perception-based 3D interaction that can be run on both systems. The next stage of our study will be gathering testers to engage our simulation on both systems and determine how well they performed on each system. Through this comparative data we will be able to draw conclusions about the similarities and differences of each system with regard to user performance of tasks involving depth-perception-based 3D interaction. Although we are still in the process of researching this mobile virtual reality system, we believe that it effectively overcomes the aforementioned limitations of immersive systems.

Poster #85/ Humanities/ Social Science

Title of Poster: Factors Influencing Judicial Outcomes on the Supreme Court of Ohio

Presenter(s): Thomas Payne

College: Liberal Arts

Advisor: Professor Eric Waltenburg

ABSTRACT:

My research project done with Professor Eric Waltenburg of the Political Science Department aims to answer the question of what attorney factors have an influence on judicial outcomes. More specifically, do repeat attorneys, those practicing in front of the same court multiple times, have more success in getting their cases heard and decided in their favor than do attorneys practicing in front of the court only once? I hypothesized that they would indeed enjoy an advantage over their one-shotter counterparts, and I found in my data analysis that this was true. I sampled 200 cases from the Supreme Court of Ohio Database from 2008, and found that there is definitely a positive relationship between repeat attorneys and success in front of the Supreme Court bench. This advantage may be due to the attorney's experience, or possibly their relationships with members of the bench. Either way, my data proved my hypothesis to be true and affirmed past research by political scientists that the repeat attorney phenomenon is indeed accurate and substantial.

Poster #86/ Mathematical/ Computational Science

Title of Poster: Computational Studies of Solvation Shell Influence on Heme Ruffling in Nitrophorin 4

Presenter(s): Samuel Egel

College: Science

Advisor: Jorge Rodriguez

ABSTRACT:

Nitrophorins are a class of heme containing enzymes used by certain blood sucking insects to transport a heme bound nitric oxide molecule into a victim's bloodstream. The nitric oxide is released from the nitrophorin on entry into the host's blood due to an increase in pH and dilution. Nitric oxide serves as a signaling molecule that induces vasodilation in a victim to provide a better blood meal for the insect. The heme group found in some nitrophorins is not planar as the heme groups in most other heme proteins. It has been hypothesized that the ruffled nature of this heme prevents reduction of the ferric iron center, allowing reversible binding of the nitric oxide and enabling rapid release of the ligand. The close packing of leucine 123 and 133 methyls to the heme has been proposed as a source of van der Waals interactions that give rise to heme ruffling [1]. The present study seeks to determine which physico-chemical interactions between the heme active site and surrounding protein residues give rise to the heme's ruffled conformation. A variety of computational approaches, including semiempirical and density functional (DFT) quantum mechanical methods, will be used to quantify the interaction energies between the iron porphyrin of nitrophorins and their surrounding residues to elucidate the physico-chemical origin of the unusual ruffled structures. [1] Roberts, S. A.; Weichsel, A.; Qiu, Y.; Shelnutt, J. A.; Walker, F. A.; Montfort, W. R. Biochemistry 2001, 40, 11327.

Poster #87/ Life Science

Title of Poster: Visual ecology of Red-winged Blackbirds and Common Grackles

Presenter(s): Brad Abplanalp

College: Science

Advisor: Esteban Fernández-Juricic

ABSTRACT:

Most songbirds use their visual systems to gather information about their environment to modulate their behavioral responses under different ecological scenarios (e.g. predator approach, foraging, mating). The area of visual coverage around the head and regions on the retina with high visual acuity (e.g. foveae) play an important role in the quantity and quality of information gathered. We measured visual fields and the position of the fovea in two species of blackbirds (Red-winged Blackbird and Common Grackle). Our results show that Red-winged Blackbirds have a wider binocular field and a wider blind area than Common Grackles. Additionally, Common Grackles have a fovea that projects laterally and slightly down. Red-winged Blackbirds' fovea also projects laterally, but slightly further forward and along the horizontal plane. The wide binocular field and fovea position in Red-winged Blackbirds brings higher acuity portions of the retina into the frontal visual field, which could allow for visual inspection of the bill when gaping. Since Common Grackles do not frequently use the gaping strategy, the cost of having a narrower binocular field is balanced by the benefit of a narrower blind area behind the head and greater overall visual coverage to detect predators.

Poster #88/ Life Science

Title of Poster: Genetic Control over Biofilms

Presenter(s): Amanda Shanley, Sean Kearney, Christopher Thompson, Gordon Showalter

College: Agriculture

Advisor: Jenna Rickus

ABSTRACT:

Graywater, wastewater originating from laundry, dishwashing, or bathing, can be recycled and reused in the home as a non-potable water source. Treatment of this water by microbial digestion provides one route to make it more amenable for storage and later use in these settings. Reactors used in microbial digestion of graywater sources often use communities of microorganisms formed in bioflms on membrane-aerated bioreactors. These biofilms suffer from two technical challenges - start-up time (flow-through of microorganisms prevents the rapid establishment of biofilm communities), and fouling (detachment of microorganisms blockades the bioreactor, preventing efficient digestion). We sought to develop a model system in which we could influence one particular species of bacteria (E. coli) to form biofilms more rapidly and to reduce their detachment once formed on a surface. At the genetic level, we designed two devices. The first enhances the formation of membrane-bound proteins for enhancing adhesion to surfaces. The other yields membrane-attached fusion proteins that bind silica, forming a continuous silica matrix over the biofilm, protecting the cells from shear-induced detachment and damage. We have shown that the adhesion proteins accelerate the rate of biofilm formation in static and continuous flow environments and that silica surfaces successfully form on cell membranes.

Poster #89/ Life Science

Title of Poster: Chromatin Factors Influencing Genome Integrity

Presenter(s): Jessica Gabbard

College: Agriculture

Advisor: Ann Kirchmaier

ABSTRACT:

Mutations in HTZ1 and defects in H4K16 acetylation have been shown to correlate with defects in kinetochore integrity and chromosome segregation; however, the mechanisms by which these defects occur are not well understood. A low level of H4K16 acetylation is present in the pericentromeric regions flanking the centromere, and this is thought to aid in proper kinetochore function. It has also been established that Htz1 is recruited by Swr1 to centromeric regions of the chromosome, which suggests a possible direct involvement of Htz1 on regulation of centromere function. Flow cytometry (FACs) assays to detect aneuploidy in strains possessing misregulated Htz1 deposition as well as those possessing defects in regulation of H4K16 acetylation are being conducted to better understand how Htz1 and H4K16 hypoacetylation influence chromosome segregation and kinetochore integrity. The performance of this technique will allow for the characterization of the specific mutations causing aneuploidy due to chromosome segregation defects during mitosis.

Poster #90/ Life Science

Title of Poster: Age-Related Changes in GAD 65/67 in the Dorsal and Ventral Lateral Lemniscus

Presenter(s): Kristin Zabrecky

College: Science

Advisor: Dr. Stephanie Gardner and Dr. Edward Bartlett

ABSTRACT:

Presbycusis, or age-related hearing loss, can result in the decreased ability to process sound. Inhibition in the ascending auditory pathway of the brain is important in sound processing and decreases with age. The lateral lemniscus (LL) forms major inhibitory projections that are critical for shaping auditory selectivity, especially in the inferior colliculus (IC). This study explored protein levels of GAD 65/67, an enzyme that synthesizes the main inhibitory neurotransmitter gamma-aminobutyric acid (GABA), of young and aged rats in the dorsal and ventral LL. It was hypothesized these regions would exhibit quantitative and qualitative differences between the age groups to explain the decreased inhibition in the IC of aged rats. GAD 65/67 levels of 6 Fisher 344 rats, 3 from each age group, were measured using Image J software for 5 different regions in the dorsal and ventral nuclei. The preliminary data analysis showed little differences between the animals, however 1 animal seemed to have slightly higher protein levels compared to the rest. These results suggested that age-related changes in sound processing may not be the result of changes in the lateral lemniscus. More testing is needed to clearly accept or reject the hypothesis.

Poster #91/ Life Science

Title of Poster: SACPD Genes in Soybean Mutants with High Levels of Stearic Acid in Seeds

Presenter(s): Daniel Sweeney

College: Agriculture

Advisor: Karen Hudson

ABSTRACT:

Soybean oil is composed of five different fatty acids, stearic, oleic, palmitic, linolenic, and linoleic, and is important for cooking and industrial purposes. Elevated amounts of stearic acid in soybean oil may be useful in some baking fats and other uses. Stearoyl-acyl carrier protein desaturase (SACPD) is a major gene involved in the biosynthesis of stearic acid in the seed. The soybean genome contains three genes encoding SACPD. N-nitroso-N-methylurea (NMU) mutagenized lines were screened for elevated stearic acid levels. Wild type soybeans contain 3-5% stearic acid and stearic acid content in the selected mutants ranged from 7-15%. We investigated whether the high stearic acid lines contained mutations in the SACPD gene. Tissue samples were collected and the DNA was extracted to amplify SACPDA, SACPDB, and SACPDC. This revealed a mutation (G2201T) in exon 2 of SACPDC in one candidate line, but no mutations on SACPDA, SACPDB, or any other region of SACPDC. The mutation resulted in an amino acid change from arginine to serine. Other lines contained no mutation in SACPDA, B, or C. The negative results provide valuable data suggesting that additional genes that contribute to high stearic acid levels lie elsewhere in the genome.

Poster #92/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Improving Profits by Reducing Damages

Presenter(s): Jason Taylor, Dexter Johnson, Xin Liu

College: Technology

Advisor: Dr. Phil Sanger

ABSTRACT:

ArcelorMittal is a steel plant in Burns Harbor Indiana. Steel plates are being run into an arm protruding from a roller table that is designed to align the plates for shipping. These problems are costing the company hundreds of thousands of dollars each year in repairs and downtime. The scope of this project is to create a monitoring and control system to prevent any future damages to the shipping table and its components and prevent a human operator from making a costly mistake. This problem can be solved with a system of laser measurement devices that monitor the width of incoming materials and compare the width of the objects to the relative position of the arm protruding from the table. If the processing unit determines that the arm is in danger it will take control of the system and move the arm back to a safe distance before relinquishing control to the operator to finish shipping operations.

Poster #93/ Physical Science

Title of Poster: Development of Characterization Techniques Using an Oxyacetylene Torch for Ablative Resistant Properties of Plasma Sprayed Ultra-High Temperature Coatings

Presenter(s): Mitchell Adducci

College: Engineering

Advisor: Professor Rodney Trice

ABSTRACT:

Ultra-high temperature ceramics (UHTC) have been of interest for applications in leading edges of hypersonic flight-capable vehicles, where operating temperatures exceed 1500°C in an oxidizing atmosphere. A characterization technique that compared the ablative resistant performance of plasma sprayed coatings that simulates flight temperatures, airflow, and atmospheric conditions without the use of expensive wind tunnels was needed. Multiple specimens of three coatings containing ZrB2, SiC, and Sm2O3 on an alumina substrate were investigated using an oxyacetylene torch based on ASTM E285 standards. The front and back side temperatures of the specimen surface were measured using an optical pyrometer and type-K thermocouple, respectively. Specimens were exposed to an oxidizing flame (1: 1.2, acetylene to O2 gas flow ratio) for up to 60 seconds with temperatures exceeding 1800°C observed. Ablative resistance is quantified by mass loss, which will be recorded. The cross sections of the coating will be analyzed using electron microscopy, and phases formed during ablation will be determined using X-ray diffraction.

Poster #94/ Life Science

Title of Poster: Genetic functional analysis of MYST4, a putative rhamnogalacturonan lyase, in Arabidopsis thaliana

Presenter(s): Elizabeth Majewski

College: Science

Advisor: Dr. Maureen McCann

ABSTRACT:

Plant cell walls are composed of polysaccharides; however, due to the complexity, establishing structure and function relationships has been difficult. I am interested in the role of rhamnogalacturonan I (RGI) in cell wall architecture and plant development. RGI is a major cell wall pectic polysaccharide that serves as a dynamic scaffold for other polymers at specific stages of plant cell development and can be cleaved by RG lyases. As the genes encoding RGI biosynthetic enzymes are not known, I propose to modulate the content of RGI in the cell wall using rhamnogalacturonan (RG) lyases. The objective of the project is to determine whether MYST4, one of a seven-member family of Arabidopsis MYST genes, encodes a functional RG lyase. Heterologous expression of recombinant MYST4 protein in Pichia pastoris will be used to confirm this prediction. To completely understand the MYST4 gene, the impact of MYST deficiency in plant growth and development will be studied using T-DNA insertional mutants in the MYST4 gene and by analyzing the impact of ectopic expression of MYST genes on the cell wall polysaccharide network. Further, wild type plants under a constitutive promoter and an estrogen-inducible promoter will be used to observe the expression of MYST4.

Poster #95/ Physical Science

Title of Poster: Molecular Mechanism of Anterior Cruciate Ligament (ACL) Injuries in Young, Female, Athletes

Presenter(s): Michelle DeVibliss

College: Health and Human Sciences

Advisor: James D. McGlothlin

ABSTRACT:

The prevalence of Anterior Cruciate Ligaments (ACL) injuries are rising and becoming more of a problem in young, female athletes. The ACL is one of the four main ligaments of the knee, which connects the femur and the front part of the tibia. The purpose of this study is to advance previous research through understanding the molecular basis of the prevention and causes of ACL injuries in young, female athletes. Understanding the biological mechanisms behind the injury will assist in the development of treatments and management of the injury. Through comprehensive research of scientific papers and studies, case studies, a survey of the Purdue soccer team, use of molecularHUB and personal experience, a base will be obtained in order to move forward. Previous research indicates that females exhibit anatomical differences as well as differences in landing techniques, which influence the incidence of ACL injury. Future plans include working with an orthopedic surgeon and experiencing ACL surgeries firsthand as well as helping aid in the development of a prevention program.

Poster #96/ Humanities/Social Science

Title of Poster: Growing London

Presenter(s): Maria Lunik

College: Agriculture

Advisor: Elizabeth Yeager

ABSTRACT:

London, United Kingdom is not a usual consideration when looking at global food production. In a city of over eight million people known for its history, culture and international melting pot, any agricultural presence is difficult to imagine. However, after an internship with a non-profit alliance focused on sustainable food and farming last summer in London, I was introduced to the little known, but quickly expanding, food and food production movement. Working specifically in the urban food production sector interested me in urban food growing elsewhere – how prevalent was it? What other cities did it exist in? Is it a merely a trend or a viable solution to the global food production issue? After a summer of learning and discovering, I decided to investigate more into urban food growing. Beginning with further research and examining global movements, I conducted a SWOT analysis of urban food growing. From the research and my internship experience, I determined urban food growing is not merely a trend, but a science and sustainable form of food production that will prove vital for the future. Looking forward, urban and suburban areas around the globe will begin introducing and investing in local food production.

Poster #97/ Life Science

Title of Poster: Evaluating New Corn Rootworm Bt Traits

Presenter(s): Joey Heneghan

College: Agriculture

Advisor: Lee Schweitzer

ABSTRACT:

The introduction of crops that contained genes from Bacillus thuringiensis (Bt) organisms and that were able to fend off insect feeding because of the insect-specific toxins they produced helped increase yields in high-pressure areas and reduce the dependence on soil and foliar applied insecticides. The early success of single trait corn hybrids with corn rootworm protection led to widespread implementation and often sole dependence of this trait for corn rootworm protection. This constant single-trait selection pressure consequently has created some resistant populations, creating the need for some new solutions. Research into “stacks”, or hybrids with multiple traits and action modes targeting a single pest, is one of the answers. This project evaluated dozens of new treatments that were previously untested. Through in-field testing these new traits were evaluated and ranked based on their performance in artificially-high corn rootworm pressures. After infesting, maintaining, digging, and washing the root masses, a standardized rating system of 0-3 was utilized to rate nodal root damage on our trial plants. Our results showed a clear distinction between control treatments and effective new traits while also exposing some ineffective new treatments. These favorable results gave us the information we needed to advance research on the effective traits and implement more testing on them on their way to potential commercialization.

Poster #98/ Life Science

Title of Poster: The Effects of Eburnamonine and 15-Methylene-Eburnamonine on Cancer Stem Cells in Breast to Brain Tumors

Presenter(s): Britney Harris

College: Science

Advisor: Julia Kirshner

ABSTRACT:

Breast to brain metastases contributed to 22,300 brain tumor cases in 2011. The majority of these cases are found in young, premenopausal women exhibiting triple negative (estrogen negative, progesterone negative, and Her2 negative) or Her2 positive (estrogen negative, progesterone negative, and Her2 positive) tumors. Less than 2% of these women survive for more than 2 years. This low survival rate is caused by the lack of effective treatments. A successful treatment has to target cancer stem cells (CSCs), which are not targeted by current therapies and are able to regenerate tumors and contribute to tumor aggressiveness, progression, and drug resistance as well as penetrate the blood brain barrier (BBB). Eburnamonine (EBN), a natural product derived from dwarf Periwinkle plant, crosses the BBB and has been used in traditional medicine as a therapeutic for oral cancers. Furthermore, EBN has no known side effects. Its chemical derivative, 15-methylene-eburnamonine (15-M-EBN), has been shown by our group to kill both triple negative and Her2 positive breast to brain metastatic cells. In addition, our data show that 15-M-EBN successfully targets CSCs. Taken together, these results suggest that 15-M-EBN has the potential to be an effective therapeutic against breast to brain metastases.

Poster #99/ Physical Science

Title of Poster: Pharma Scale Up

Presenter(s): Jason Ban

College: Engineering

Advisor: Carl Wassgren

ABSTRACT:

Scaling Particle Dynamics in Rotating Drum Coaters J. Ban, R. Kumar, and C. Wassgren School of Mechanical Engineering Purdue University Abstract Scaling of particle coating operations is an important issue for a number of industries, including those that process pharmaceuticals, consumer products, and chemicals. Scaling of particulate processes, and coating in particular, has been the subject of numerous experimental, computational, and analytical studies. Unfortunately, a dependable scaling method that fully translates data gathered at the lab scale to the industrial scale does not exist, especially since geometric similarity is often neglected. This study investigates how imperfect particle size scaling affects the particle dynamics and inter-particle coating variability in geometrically similar pan coaters. Discrete element method computer simulations were used to model particle movement in five different-sized rotating, horizontal cylindrical drums, resulting in five different particle diameter-to-drum diameter ratios, but with identical dimensionless fill fractions and rotational speeds. Measurements of particle surface velocities and time spent in the coating zone were made, with the particle coating zone residence time coefficients of variance (CoVs) used to determine the degree of inter-particle coating variability. Surface velocity profiles show good agreement with those found in the literature; however, the velocity scaling behavior is different. The size of the coating zone was found to have no influence on the long term CoV behavior, a result that has not been described previously in the literature. Decreasing the particle-to-drum diameter ratio results in reduced particle mixing and smaller CoV values after the same number of drum rotations. This last finding demonstrates that the current approach to scaling without maintaining geometric similarity between the particles and the drum can result in significant errors in scaling. Future work should examine the development of a model or correlation that can account for imperfect particle-to-drum diameter scaling.

Poster #100/ Humanities/Social Science

Title of Poster: Tourette Syndrome from a Medical Anthropology Perspective

Presenter(s): Kateyln Reavis

College: Liberal Arts

Advisor: Dr. Andrew Buckser

ABSTRACT:

This research aims at understanding the way people manage Tourette syndrome in different cultural contexts. Dr. Buckser has already conducted interviews in the United States, and now the goal is to broaden the scope of the project to encompass other cultural views on this disease. I have used online and library resources to collect data on local terms for Tourette Syndrome as well as associated diseases and treatments. The goal is to look at these factors and overlay them with other topics like government structure, healthcare system, dominant religion, and diagnostic criteria. The aim is to gain an understanding about what factors affect cultural attitudes about Tourette syndrome and those who live with the disease. We are also looking at how medical research dictates attitudes about Tourette. We are analyzing all of this data geographically using ArcGIS and will be displaying it on a world map. This research project is still in progress.

Poster #101/ Life Science

Title of Poster: Analysis of domain deletion alles of the PICKLE chromatin remodeling factor

Presenter(s): Erin Nicklow

College: Agriculture

Advisor: Joe Ogas

ABSTRACT:

PICKLE (PKL) plays a key role in controlling gene expression by altering chromatin structure in plants. In particular, loss of PKL leads to inappropriate expression of developmental regulators, which causes developmental abnormalities. PKL belongs to a family of chromatin remodelers that contain four conserved domains. The function of these domains is unknown in plants. This research project examines whether each of these domains is necessary for normal function of PKL in the model laboratory organism Arabidopsis thaliana. We generated transgenic plant lines that only express variants of PKL that lack one of the four conserved domains. The phenotypes of these transgenic lines are being analyzed to determine if the deleted domain is necessary for PKL function. Preliminary results indicate that all four domains are necessary for PKL activity in vivo. As a result of our analyses, we are now able to examine how these domains contribute to PKL activity in plants, in particular with regards to targeting.

Poster #102/ Physical Science

Title of Poster: Increasing Nonlinear Optical Detectability of Crystals Using Dye Intercalation

Presenter(s): Richard Closser

College: Science

Advisor: Prof. Garth Simpson

ABSTRACT:

In order to determine the structure of macromolecular compounds, X-ray crystallography is typically used, which requires that the compounds be in a crystalline form. Due to the trend towards smaller crystals being formed upon crystallization, positively locating the crystalline structures within their medium has become a difficult task. New techniques using nonlinear optical microscopy have recently been developed that allow for the detection of very small crystals within their amorphous environment, typically with a high signal-to-noise ratio. Unfortunately, not all crystals are able to produce a detectable nonlinear optical signal. For this reason, the goal of this research is to increase the nonlinear signal produced from protein crystals by dye intercalation either during or after crystallization. Initial results have shown that a ~500 fold increase in signal can be produced by the dye intercalation, though more work needs to be done in order to maximize the types of crystalline structures eligible for this method. Further work involves covalently bonding the dyes into the crystalline structures and to evaluate effects the dyes may have on the crystalline structures.

Poster #103/ Life Science

Title of Poster: Characterization of VGluT2-positive axon terminals in MGB in young and aged rats

Presenter(s): Eric Pujari

College: Science

Advisor: Stephanie M. Gardner

ABSTRACT:

Age-related hearing problems can result in deficits in differentiating foreground and background noises although the underlying mechanisms are not fully-characterized. The ascending auditory pathway consists of several brain regions involved in identification and extraction of important sound features. The Medial Geniculate Body (MGB) receives excitatory inputs from the Inferior Colliculus (IC) and can be identified by the presence of Vesicular Glutamate Transporter 2 (VGluT2). The MGB is known to be characterized differently between dorsal, ventral medial, ventral, and ventral lateral divisions. In an attempt to better understand age-related changes in the auditory system that lead to decreased hearing ability, VGluT2-positive axon terminals in the MGB were labeled and quantified in young adult and old F344 rat brains. These images were analyzed using an imaging software to measure the area and the distribution of VGluT2-positive axon terminals. We hypothesized that large excitatory terminals from the IC are affected by age. In old rats, we found the median dorsal terminal area was larger than that of the combined ventral regions. Variation in terminal areas are slight when compared to previous young rat data, however, terminal density in old brains were higher. This suggests that density may be correlated with decreased auditory specialization.

Poster #104/ Life Science

Title of Poster: Determining the Role of DNTTIP1 in Callipyge Sheep Muscle

Presenter(s): Kimberly Lutz

College: Agriculture

Advisor: Dr. Christopher Bidwell

ABSTRACT:

Callipyge sheep have a mutation in the DLK1-DIO3 imprinted gene cluster which results in a 30-40% increase in muscle mass without altering live weight. There is also a change in the myosin gene expression causing an increase in fast twitch glycolytic fibers. Previous gene expression studies have shown that DNTTIP1 (terminal deoxynucleotidyl transferase interacting protein 1) is up-regulated in the callipyge muscle. The objectives of this project were to 1) confirm the cellular localization of DNTTIP1 and 2) determine if DLK1 and DNTTIP1 expression can alter myosin gene expression. Immunohistological detection of DNTTIP1 in transfected C2C12 cells confirmed its nuclear localization. The effect of DLK1 and DNTTIP1 on myosin promoter activity in mouse primary myotubes was tested using luciferase reporter assays. Over-expression of DLK1 and DNTTIP1 were shown to significantly up-regulate the MYH4 (fast twitch glycolytic) promoter and down-regulate the MYH7 (slow twitch oxidative) promoters. These results were consistent with changes in myosin gene expression in callipyge muscle.

Poster #105/ Life Science

Title of Poster: Identifying histone residues important for Set1 and Jhd2 to mediate H3 lysine 4 methylation

Presenter(s): Gabriel Rangel

College: Agriculture

Advisor: Dr. Scott Briggs

ABSTRACT:

In development, all cells start will the same DNA sequence but what type of cell it becomes is determined by which genes are expressed. The underlying process for controlling what genes are expressed in a cell is called epigenetics. An important epigenetic mechanism controlling gene expression is methylation, a chemical modification that occurs on histone proteins (H3, H2A, H2B, and H4) that DNA wraps around. Specifically, trimethylation of lysine 4 on histone H3 (H3K4me3) is needed for proper gene expression. The enzymes responsible for the addition and removal of H3K4me3 are Set1 and Jhd2, respectively. To determine if amino acid residues other than H3K4 are needed for wild-type levels of H3K4me3, a series of point mutations and regional deletions at the N-terminus of H3 where created and measured via Western blot analysis using methyl-specific histone antibodies. Interestingly, mutations of H3 lysine 14 (H3K14) resulted in the demethylation of H3K4me3 via Jhd2's demethylase activity. In contrast, H3 deletions abolished all H3K4 methylation independent of Jhd2's activity, suggesting Set1 activity is dependent on these H3 residues. Understanding how histone methylation occurs is vital because abnormalities in epigenetic mechanisms are likely the underlying cause of many diseases such as cancer and diabetes.

Poster #106/ Life Science

Title of Poster: Improving the Titanium Implant with a Novel Surface Chemistry via Chondroitin Sulfate and PEDOT copolymer

Presenter(s): Taeyong Ahn

College: Engineering

Advisor: Dr. Lia Stanciu

ABSTRACT:

There is an urgent need to improve life expectancy of the hip implant because the general population is becoming older thanks to advances in medicine. This aging trend brings a problem for patients receiving the hip implant because the life expectancy of the current hip implant is only about 15 years. Its short life expectancy means patients using the implant more than 15 years will most likely be forced to replace the failed implant with a new one. A major surgery, such as a hip replacement, is dangerous for anybody, especially for old patients. To lengthen its life expectancy, the implant needs to contain a specific surface chemistry promoting bone ingrowth on the implant. Desirable surface chemistry can be achieved by employing Chondroitin sulfate (CS) and poly(3,4-ethylenedioxythiophene) (PEDOT). Both CS and PEDOT are expected to help osteoblasts to proliferate. The copolymer of CS and PEDOT is created via oxidative polymerization in-situ on the titanium alloy via the spin coating technique. The copolymer is successfully synthesized and adhered onto the titanium alloy. Microstructural characterization and tissue culture for osteoblasts on the titanium alloy will be required to confirm the effectiveness of the copolymer.

Poster #107/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Material Improvements on a Novel Porous Plate for a Slow Sand Filter (SSF) System

Presenter(s): Taeyong Ahn, Ananth Raman, Amanda Cooper, Lawrence Nichols, Yijiao Chen

College: Engineering

Advisor: Dr. Howarter and Dr. Jafvert

ABSTRACT:

Students in rural Barbosa, Colombia have limited access to abundant clean water due to reliance on surface water which has high concentrations of harmful microorganisms. Slow sand water filtration (SSF) is one option for point-of-use water treatment to address this problem. SSF fits our design constraints of reusability, low relative cost, and at a bench-scale. In this redesign, a porous plate serves as a structural component and exit pathway for filtered water, initially started as a gravel layer. Replacing this gravel layer maximizes the sand depth which effectively increases the filtered water yield. Our group seeks to identify adequate materials that can replace existing plastic components, specifically the porous plate, and can be processed inexpensively while maintaining mechanical stability. An initial prototype was fabricated by compression molding high-density polyethylene with varying amount of sacrificial filler to create a porous structure. However, the process was uncontrolled and uneven pore distribution resulted in unwanted preferential flow. Thus, we designed a prototype based on optimizing pore size, material properties and plate dimensions. These factors allow for further geometrical optimization of the porous plate, which can be fabricated via a 3D printing-rapid prototype supplied by the Ideas to Innovation Lab.

Poster #108/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: The Effects of Artificial Intelligence in Single Player Video Games on Player Immersion

Presenter(s): Eric Franklin, Abby Guetzlaff, Ben Shutt, Phil Gallam

College: Technology

Advisor: David M. Whittinghill MS, Ph.D.

ABSTRACT:

Often when playing a single-player video game, the player's immersion is interrupted because of how the artificial intelligence (AI) controlled characters act is inconsistent with the player's perception of how they should act within the game, thus degrading the player's experience. We will be testing how the the different aspects of the actions of AI controlled characters effects player immersion. The aspects being tested will be the characters aggression, willingness to flee, and the difficulty of defeating the characters. level by measuring how much time the player thinks has passed during their session compared the how much time actually passed, the levels of emotional arousal the player experiences, and the amount of player eye movement. We hypothesize that characters that are willing to flee, are aggressive, and are difficult to defeat will be more immersible. The results of this study will help game developers create AI controlled characters that increase the level of immersion in their games.

Poster #109/ Humanities/ Social Science

Title of Poster: "Incomparable Pacience and Endless Mercie:" The Reigning Virtues of Mary Tudor

Presenter(s): Kelsey Campbell

College: Liberal Arts

Advisor: Melinda Zook

ABSTRACT:

My thesis will discuss Mary Tudor's readiness for the throne as the first reigning Queen in England, and argue that she was as well prepared to do so as any of the Tudors, including her half-siblings, Edward VI and Elizabeth I. For the purposes of my thesis, I am defining well prepared as Mary receiving the same education and political experience as her more favorably remembered siblings. I want to look at the path that brought Mary to the throne, and how her life prepared her for her role as England's first ruling queen. I want to examine how she chose to rule, looking at the precedents she set, as well as those she broke, as she strove to be a feminine "king." Thus, my thesis is both political and gender history as I will be looking at the gender biases inherent in Mary's education and ascension, and the political repercussions of England's first ruling Queen.

Poster #110/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Use of Radiation-Induced Ultrasound to Image Proton Dosimetry

Presenter(s): Derek Baker

College: Health and Human Sciences

Advisor: Keith Stantz

ABSTRACT:

The purpose of this study are to simulate the ionizing radiation induced thermoacoustic signal from scanning proton beams; and investigate the various designs and techniques of ultrasound tomographic imaging to map three dimensional dose (3D) distribution in proton therapy. A 3D dose and proton fluence distribution in a water phantom from a scanning spot beam from a treatment nozzle was simulated using a Monte Carlo (MC) code for differing proton ranges, and their thermoacoustically generated signals generated. An initial radio-acoustic computed tomographic (RCT) scanner design consisting of transducer array in cylinder design was developed and used to reconstruct the dosimetric image volume. Comparison of the Bragg peak to the MC results demonstrated similar beam profiles, where the RCT intensity dependence on depth at the distal edge of the Bragg peak was within binning size of the reconstruction image and MC position prediction. This feasibility study demonstrates that RCT can be used to monitor the dose distribution and proton range in proton therapy. We will also present, and are currently constructing, a RCT/phase-array tomographic calibration phantom to measure the Grueneisen parameter, a key parameter in the quantification of dose.

Poster #111/ Life Science

Title of Poster: Analyzing the Relationships between Morphology of Early Human Skulls using Procrustes Analysis

Presenter(s): Yunsung Kim

College: Science

Advisor: Dr. Peter J. Waddell

ABSTRACT:

Cranial morphology has been widely used in determining evolutionary relationships between species, especially early humans, as fossilized skeletons are often times incomplete. Using the Procrustes analysis method, a data set containing fourteen specific landmarks for fifty-two skulls, ranging from 1.81±0.05 Ma to XX century, were analyzed in attempts to reveal possible signs of hybridization between Neanderthals and modern humans. Pair-wise Euclidean Procrustes distances were calculated by superimposition of every possible pairs of skulls and the resulting matrix was plotted as a phylogenetic network. Then, possible hybrid skulls were modeled by calculating the mean of two skulls after superimposition. Hybrid data was also plotted on the phylogenetic network. The preliminary network showed three large clusters: modern humans, Neanderthals, and ancient humans (H. erectus, H. habilis). With addition of hybrids, Qafzeh 6 - a skull from 90~130 ka discovered in Israel – clustered closely with the modeled hybrids. This could be an indication of hybridization between Neanderthals and H. sapiens.

Poster #112/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Drinking Water Treatment in Rural Colombia - Sand Production and Optimization Team

Presenter(s): Kendra Johnston, Minju Lee, Taylor Bousman, Munkyo Suh, Taisha Venort

College: Engineering

Advisor: Chad Jafvert, John Howarter

ABSTRACT:

About 800 million people worldwide lack access to improved sources of drinking water, a statement valid for 88% of Colombia's people. In rural schools near Barbosa, untreated surface water is boiled to disinfect it, yet it remains highly turbid and often odorous. Slow sand filtration is an appropriate water treatment process that improves water quality by removing suspended particles and dissolved organic matter that cause these issues. The design and operation of batch point-of-use slow sand filters was evaluated in this study. To expedite filter assembly, a portable sand sieving trommel that reduced the time of sand preparation by 8 times compared to use of flat sieves was constructed. Tracer tests were performed to determine the volume of water that could be added before breakthrough in order to define the appropriate batch treatment volume. Additionally, filter effluent turbidity was measured as a function of sand grain size (>1.6 mm, 0.5-1.6 mm, 0.3-0.8 mm). Daily turbidity measurements indicated that the smaller grain sizes resulted in lower turbidity of effluent water, while a modest redesign of filter components, to allow addition of more sand, increased batch treatment volume to 5 L per pail, allowing treatment of 15 L of water per day per filter.

Poster #113/ Physical Science

Title of Poster: Analysing the different states of Photosystem II.

Presenter(s): Vatsal Purohit

College: Science

Advisor: Yulia Pushkar

ABSTRACT:

Abstract The photosystem II protein complex functions as a water oxidizer, creating Hydrogen ions and molecular Oxygen in the process. The study of this complex can give us an insight into the mechanism most plants use to split water. This technology could eventually be applied to create Hydrogen fuel cells that could act as an alternate energy source. In order to study the Photosystem II protein complex, one of the methods adopted is examining the X-ray absorption spectrum of PSII samples in different S states, which are the different conformations the protein exists in as it absorbs photons. However, in order to do so, capturing the protein in a particular S state happens to be a challenge. This research outlines the methods used for preparing samples in different S states by using laser flash techniques and eventually using Electron Paramagnetic Resonance spectroscopy to check if they have been formed. The EPR spectrum seems to verify that this technique is effective in creating such samples and can further be explored by trying to capture states that exist within a shorter time frame.

Poster #114/ Life Science

Title of Poster: PNA as a Novel Therapeutic to Target Intracellular Pathogens

Presenter(s): Muhammad Soofi

College: Science

Advisor: Dr. Mohamed Seleem

ABSTRACT:

By the time you have finished reading this abstract, eight individuals will have become infected by Salmonella in the United States alone. By the end of the day, two Salmonellosis patients will have died and Salmonellosis infections will have cost the American healthcare system over $8 million. The rising incidence of multidrug resistant strains alongside of the palpable impact of Salmonella on domestic and international healthcare systems provides a great impetus to develop novel antibacterial agents that can combat Salmonella. Peptide Nucleic Acids (PNA) are small nucleic acids that can be engineered as agents capable of blocking the expression of specific essential genes required for bacterial survival, thereby killing the bacteria. This study determined the efficacy of two PNA constructs designed to target the critical α-subunit and the sigma factor of Salmonella RNA polymerase. In vitro analysis revealed that both constructs led to significant reduction of Salmonella at 5 μM and complete elimination of Salmonella at 15 μM. During in vivo testing, at a PNA concentration of 15 μM, the anti-α-subunit construct was able to completely eliminate intracellular Salmonella after a longer 24 hour incubation. The ability of PNA constructs to effectively eliminate Salmonella in both extracellular and intracellular infection models highlights its potential as a new antibacterial agent. The novelty and effectiveness of antisense PNAs suggests that PNA constructs may play a role in addressing the need for innovative therapeutics to combat antibiotic resistant strains.

Poster #115/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: CodeGents

Presenter(s): Lisa Tryon, John Brown

College: Technology

Advisor: Ron Glotzbach

ABSTRACT:

The Cogent Management System is an artificial financial system. It gives students in Computer Graphics Technology a chance to explore business finance in a controlled environment. Students can hire and be hired by other students for and buy company stock. The system culminates in CGT 411/450 where students form companies that create a real-world product. Unfortunately, the old system had an unacceptably high administrative overhead. Since the biggest time consuming activity was approving common financial transactions we elected to automate their approval. After surveying previous financial transactions, we determined several categories that could be automatically approved. Our research focused on testing these automation procedures to ensure that the automation neither allowed fraudulent transactions to be approved nor separated the administrator too much from what the students were engaged in. By finding the balance between automation and human supervision the Cogent Management System became a more effective and efficient tool for teaching students.

Poster #116/ Mathematics/Computational Science

Title of Poster: Bandwidth-Efficient Reliable Broadcast

Presenter(s): Christopher Cole, Daniel Roberts

College: Science

Advisor: n/a

ABSTRACT:

Many modern computing applications, such as data warehousing, distributed computing, and content streaming, require large quantities of information to be broadcast rapidly over a network. Unfortunately these transmissions are not always reliable, as hardware and software failures can cause messages to be lost or corrupted. In situations where fault tolerance is essential, traditional broadcast algorithms guarantee correctness by retransmitting data between all computers (peers) in the network. This method ensures that the message will be delivered regardless of the number of peer failures but at the cost that the total data transmitted grows as the square of the number of peers. This constraint, coupled with the high cost of network bandwidth relative to processing power or onsite storage, renders many potential applications intractable. We propose an alternative protocol called RaptorCast, which leverages the properties of digital fountain codes to achieve reliable broadcast with much lower bandwidth usage. In particular, by relaxing the strict fault tolerance requirements of traditional algorithms, we can keep bandwidth use linear in the total number of peers, while ensuring correctness up to an arbitrary number of peer failures. This property, known as fault resilience, is sufficient for many internet applications, and could allow organizations to replicate mission-critical data across a large number of computers for maximal information assurance without sacrificing on-line system performance.

Poster #117/ Physical Science

Title of Poster: The Effect of Multiple TMOS Coatings upon Impedance and Charge Carrying Capacity

Presenter(s): Johnny Zhang

College: Engineering

Advisor: Kevin Otto

ABSTRACT:

Cortical prostheses allow researchers to interface with higher order brain processes in an attempt to communicate with neurons previously unreachable due to disease or injury. Though neurally implanted microelectrodes are able to stimulate and record from neurons in the brain, their effective lifetime is short. One theory behind their failure is the reactive tissue response (RTR). Microglia and other immune cells form a barrier to isolate the microelectrode from the neurons of interest. A method to circumvent the RTR is coating the electrode in a biocompatible substance or applying drugs or biomolecules to mitigate the response. Tetramethyl orthosilicate (TMOS), a monomer, can be polymerized into a porous, biocompatible thin film polymer and coated upon the electrode surface. The porous nature of TMOS also makes the coating a potential vehicle for local drug delivery. By applying multiple coats of TMOS, the speed of the drug delivery can be controlled; making it more effective in mitigating the RTR. By analyzing electrode properties such as Impedance and Charge Carrying Capacity, we have determined the optimal number of layers to apply while maintaining stable electrical recordings. It is believed that improving the longevity of these microelectrodes in vivo will improve microelectrode lifetime and performance.

Poster #118/ Life Science

Title of Poster: Controlled Release to Attenuate Foreign Body Response of Neural Tissue to Electrode Implantation

Presenter(s): Anna Filley

College: Engineering

Advisor: Dr. Kevin Otto

ABSTRACT:

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 platform for the gradual release of protein. To determine the optimal conditions for a controlled, gradual release, we analyzed four different coatings, which varied in number of layers and method of protein incorporation. A spectrophotometer was used to quantify the release of protein from the probes into solution over time. Results of this work will help increase understanding of controlled drug release, and aid in the ability to modulate the FBR of neural tissue.

Poster #119/ Innovative Technology/ Entrepreneurship & Design

Title of Poster: Sliding Friction Testing of Model Shoe Treads Fabricated by 3D Printing

Presenter(s): Ananth Raman, Anthony Hill

College: Engineering

Advisor: Prof. Kendra Erk

ABSTRACT:

Tread design is a fundamental consideration when it comes to designing running shoes. The mechanical implications of choosing a tread design greatly affect a shoe's performance for the runner. Initial research was aimed at discerning the relationship between shoe tread pattern and the coefficient of friction. Utilizing Google Sketchup, three tread designs were developed for frictional testing, increasing in complexity. The tread designs were then transferred to input software used by an Eden350 3D Printer. The 3D printer used a FullCure 720 model transparent resin, which is a hard rapid prototyping material. An apparatus was used to alter a tensile machine for the use of frictional testing of the three samples. A design of experiments was carried out over the samples on test surfaces of Teflon and sandpaper, in both dry and wet conditions. Using the load and displacement data generated, static and kinetic coefficients of friction values were determined for each trial. Observations noted were relatively higher values for coefficients of friction (static and kinetic) for the wetted sandpaper surface with a larger variation of data values compared to the Teflon surfaces. As expected, the wetted Teflon tests yielded the lowest coefficients of friction.

Poster #120/ Life Science

Title of Poster: Composition of Heavy Metals in Bone Marrow and Intact Bone Tissue of Femur

Presenter(s): Alexander Jones

College: Health and Human Sciences

Advisor: Dr. Wei Zheng

ABSTRACT:

Many industrial employees are exposed to a variety of heavy metals and other hazardous substances throughout employment. Chronic heavy metal exposure can lead to the accumulation of these metals within the body at toxic levels, causing an array of neurodegenerative conditions. The metals accumulate in various tissues throughout the body, but bone is of particular interest because it is a site of storage for many compounds. However, the distribution and relative concentrations of heavy metals within bone components is unknown. In this study, both femurs were collected from five control, untreated Sprague-Dawley rats. Bone marrow was collected from one of the femurs, and the other femur was collected as intact tissue. Atomic absorption spectrophotometry was used to quantify concentrations of manganese (Mn), iron (Fe), copper (Cu), and zinc (Zn) in the collected tissues. Concentrations of Mn, Cu and Zn were significantly higher in the intact femur than in bone marrow, while Fe was significantly higher in bone marrow than intact bone. Our results suggest that metals have their unique distribution pattern in the bone; this may help explain the extent of their accumulation in bone and toxicity to bone tissue.

Poster #121/ Innovative Technology/Entrepreneurship & Design

Title of Poster: A novel tool designed to determine the mechanical stability of pacemaker leads during surgery

Presenter(s): Elizabeth Mercer, Johnny Zhang

College: Engineering

Advisor: Ann Rundell

ABSTRACT:

The current methods of determining the mechanical stability of pacemaker leads during the initial implantation is subjective and focuses more on the electrical connection. If a pacemaker lead dislodges during surgery, the cardiologist and nurses are prepared to implant the lead again, but a dislodged lead outside of the hospital setting is potentially deadly. The clinical need is a new feedback technique performed during surgery to provide a more secure pacemaker lead placement. We have developed a new device that provides physicians with a visual and tactile feedback system indicating the mechanical stability of pacemaker leads. Our solution consists of two parts connected by magnets and attaches to the proximal end of current pacemaker leads. After the lead has been fixed into the heart, the device is attached and pulled. If the lead is not mechanically stable, the lead will be pulled out of the cardiac tissue. If the lead is mechanically stable, the back end of our device will disengage from the front end. Implementation of this device in conjunction with current feedback systems will minimize the chances of improper lead placement in cardiac tissue for pacemakers.

Poster #122/ Humanities/ Social Science

Title of Poster: Explaining the Rise of Black Racial Consciousness in Chicago: How Discrimination and Disillusionment Gave Rise to Racial Solidarity, 1919-1940

Presenter(s): Olivia Hagedorn

College: Liberal Arts

Advisor: Dr. Melinda Zook and Dr. Cornelius Bynum

ABSTRACT:

My thesis examines the ways in which the social conditions of Chicago's Black Belt contributed to the rise of black racial solidarity from 1915 to 1940. My questions are twofold. First, what types of social conditions adversely affected black Chicagoans? Second, how did blacks respond to these conditions? If they did respond with racial solidarity, what forms did it take, and what impact did it have? Newspaper articles, editorials, magazines, and advertisements from the time indicate that blacks living in early twentieth-century Chicago did, in fact, encounter racism, discrimination, and even violence. More importantly, though, they also reveal that blacks responded to these circumstances collectively. In other words, black Chicagoans resisted the violence and discrimination perpetuated against them through racial solidarity. Ultimately, my thesis will add credence to the notion that blacks were racially united before the advent of the Civil Rights Movement. Furthermore, my project demonstrates that black Chicagoans were not merely victims of an oppressive social order but that they took control over their own destinies. Their institutions, clubs, societies, and calls for racial solidarity marked a determination on their part to assert control over their community's welfare.

Poster #123/ Physical Science

Title of Poster: Shale-Oil Stratigraphy Datapack for TSCreator Visualization and Chart Making

Presenter(s): Justin Wright

College: Science

Advisor: James Ogg

ABSTRACT:

Shale-Oil Stratigraphy Datapack for TSCreator Visualization and Chart Making There is a vast array of written material available to describe rock formations in the United States. There are also volumes of stratigraphic columns available as a visual representation of these formations. However, this project effectively joins these two mediums into one combined visual and written representation. Utilizing software know as Time Scale Creator, one can construct a visualization of the geology in a desired location on Earth. Essentially, these are interactive stratigraphic columns that provide pop-ups of formation descriptions when clicked. With the aid of COSUNA charts (Correlation of Stratigraphic Units of North America) from AAPG (American Association of Petroleum Geologists), data is entered into Microsoft Excel, which can then be saved as a text file and entered into Time Scale Creator. This assists both educators and researchers alike. While thousands of strat columns already exist for Time Scale Creator, this data package in particular focuses on shale oil and gas regions in the United States. One can analyze the geology that both preceded and followed our country's major fossil fuel reservoirs and thus infer what other locations might house economic amounts of hydrocarbons.

Poster #124/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Man Portable Bridge for the USAF

Presenter(s): Charles Walls, Elijah Staley, Ben Lutz, Mike Frey, Alex King

College: Technology

Advisor: n/a

ABSTRACT:

United States Air Force (USAF) Special Tactics Battlefield Airmen execute rescue and assault operations around the world. During these operations the Airmen are faced with a multitude of obstacles to traverse that can vary from mission to mission. These obstacles can include irrigation canals, crossing rooftops, crossing minefields, fast flowing streams, snow and glacier crevices, desert rock formations, unstable/collapsed structures, and compound walls. Currently there is no one system that can safely navigate all of these obstacles. The solution to this problem must be able to span a gap of 20 feet, hold up to 350 lbs, weigh less than 20 lbs, and be re-usable. The final design is an arch made of 10 modular pieces of high strength foam sandwiched between sheets on carbon fiber, which are coupled together using aluminum joints. End pieces have been designed that will couple ropes on either side of the device that run underneath the arch. These ropes have extremely low elasticity and account for the horizontal forces created by the arch shape. This design could see potential use across any branch of the military and could potentially save the lives of the operators using it.

Poster #125/ Life Science

Title of Poster: Generating Diverse Kinase Biosensors Using Thiol-Ene Click Chemistry

Presenter(s): Aditya Babar

College: Science

Advisor: Dr. Laurie Parker

ABSTRACT:

Chronic Myelogenous Leukemia (CML), a white blood cell cancer, is caused by the reciprocal translocation of the BCR gene on Chromosome 22 with the ABL gene on Chromosome 9 to form a hybrid chromosome (also known as the Philadelphia Chromosome). The oncogene produces a fusion protein, Bcr-Abl, that is constituively active and and drives the progression of the leukemia. CML is currently treated with imanitib (commercially known as Gleevec), which is a Bcr-Abl tyrosine kinase inhibitor. The drug has been shown to restrict propagation of Bcr-Abl-expressing white blood cells. However, some patients develop resistance to imanitib; therefore, there is a need to develop efficient molecular monitoring techniques to assist in managing the disease. Our laboratory focuses on developing peptide-functionalized biosensors as diagnostic tools to understand Bcr-Abl signaling in the context of CML. In this current project, we are developing peptide biosensors to monitor the activity of Bcr-Abl/Abl kinase that is involved in the progression of CML. The biosensors are assembled using thiol-ene click chemistry and are composed of a substrate module and other ligands favorable for protein interaction. Kinase assays are carried out to screen the activity of Abl kinase in relation to the biosensor.

Poster #126/ Mathematics/ Computational Science

Title of Poster: The probability that a 2x2 matrix has all real eigenvalues

Presenter(s): Jingdan Liu

College: Science

Advisor: Jonathon Peterson

ABSTRACT:

Matrices are important in the fields of mathematics and statistics, especially linear algebra, and it is natural to wonder how likely it is that a matrix with integer entries is diagonalizable. Recently, Hetzel, Liew, and Morrison answered this question for 2x2 matrices. Unfortunately, their method does not seem to be useful for answering the question for 3x3 and larger matrices. Motivated by this, we develop a different method for answering the question for 2x2 matrices that will hopefully be useful in the 3x3 case as well. Our method requires finding the joint distribution of the determinant and trace of a 2x2 matrix with entries uniformly chosen between -1 and 1, a task which was surprisingly difficult.

Poster #127/ Life Science

Title of Poster: Electro-Curcumin-Therapy for Effective Cancer Treatment

Presenter(s): Wan-Ying (Cindy) Lin

College: Science

Advisor: Dr. Raji Sundararajan

ABSTRACT:

Every 12-13 minutes a woman in the US and every 50 seconds one in the world die due to breast cancer. Overall, millions die each year due to cancer. There is a critical need for additional/alternate treatments for those who do not respond to current standards of cure. The objective of this research is to develop safe, novel, electroporation-based, curcumin (turmeric extract, natural herb proven for its antiseptic, antioxidant, anti-inflammatory, and anticancerous benefits) therapy for effective cancer cure. The hypothesis is that uploading curcumin using electrical pulses will enhance its bioavailability and kill cancer cells. Electrical pulses render cell membranes permeable to otherwise impermeant/poorly-permeant anticancer drugs. MCF-7, breast cancer, HeLa, Cervical cancer, and HL60, Leukemia cells were studied using 50/100µM curcumin doses. Results indicate a drastic reduction (0% viability after 24hr) in the proliferation of the cells treated with curcumin and electric pulses indicating its potential for clinical applications. A disease of affluent, industrialized western world, cancer is now among high to low income countries also. This necessitates the need for low cost and effective treatments. Electrical pulse-mediated enhanced drug delivery using natural, potent herb, turmeric is a boon to those who do not respond to current standards of cure.

Poster #128/ Life Science

Title of Poster: Excavation of Prestige Crafts at Cahokia Mounds

Presenter(s): Michael Lockman

College: Liberal Arts

Advisor: Corin C. Pursell

ABSTRACT:

Much of what of what is known about Mound 34 at Cahokia Mounds in Collinsville, Illinois is anecdotal evidence related by self-trained archaeologist Gregory Perino from his 1956 excavations of the site in search of artifacts for the Gilcrease Museum. The objective of the 2012 investigation was to identify the southernmost wall of a copper workshop indicated by Perino and identified in the 2007 field season at Mound 34 under the direction of Washington University's Dr. John Kelley. Our investigation was a follow-up to the 2008 field season on Mound 34 in which "the primary objective was centered on determining the extent of the western copper workshop defined by [Gregory] Perino (n.d.), the western margins of which were located in 2007, as well as the context of these materials" (Kelly 13). Four weeks of excavation yielded a plethora of pot sherds and faunal remains which were subsequently catalogued for the Cahokia Mounds Museum Society. At no point during the investigation was Perino's backfill escaped. Findings from this investigation are crucial to discerning the extent of Perino's excavations for future field seasons; it is imperative to escape Perino's back dirt and validate claims about what he encountered when excavating Mound 34.

Poster #129/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Impact of Inkjet Media Design on Metallic Printing with Metal Oxide Ink

Presenter(s): Hongqian Wang

College: Science

Advisor: n/a

ABSTRACT:

Inkjet printing has become a popular way of recording images on various media surfaces. There is a growing demand for digitally printed content which is no longer limited to the traditional black-white text images and CMYK full color photo images, but extends also to producing prints with visual special effects such as the metallic appearance. Inkjet printing with inks based on dispersions of conductive metal oxide nanoparticles may create prints that have visual interest and depth delivering rich, vibrant colors and providing a new avenue for artistic expression. In order to have human-perceivable metallic appearance, the image formed on the media printed with metal oxide-based ink must generate strong directional reflection of incident light. For the above reason printing media should be able to force metal oxide nanoparticles to form a thin and uniform continuous metal oxide film. Otherwise the print produced by the metal oxide ink will not have metallic appearance. The research was conducted with the purpose to understand impact of inkjet media design on metal oxide ink/media interactions resulting in prints with metallic appearance. The pore volume and surface pore size of the media were found to have significant influence on the metallic appearance of the prints.

Poster #130/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Development of a Spherical Acoustically Tensioned Metastable Fluid Detector for Ascertaining 4π Neutron Directionality

Presenter(s): Nicholas Wilson

College: Engineering

Advisor: Professor Taleyarkhan

ABSTRACT:

Neutron detection is used across many fields, from scientific research, health physics, to national security. Work is being done at the Metastable Fluids and Advanced Research Laboratory (MFARL) at Purdue University in order to develop neutron detectors to compete with current He-3 detectors. Tensioned Metastable Fluid Detectors (TMFDs) are being developed to be competitive to current state of the art detectors. These detectors will offer many advantages over current He-3 detectors. The TMFD has ~90% efficiency rating for MeV neutrons and thermal neutrons. The on-off times for TMFDs are within microseconds. TMFDs are blind to gamma photons, and therefore, have no gamma saturation issues. The TMFD is able to ascertain directionality in 2π to within 10° using a single system, and modeled to ascertain 4π directionality to within 0.018 steradians with a 68% C.L. with the acquisition of 2000 detection events. The TMFDs are able to detect both neutrons (thermal and fast) and alphas. Even with these advantages the production cost of a TMFD can be significantly lower (x10) than the cost of a He-3 Detector. The work being presented focuses on the physics behind TMFDs and the recent advances in determining angular resolution in full scope three dimensions.

Poster #131/ Life Science

Title of Poster: In-Package Cold Plasma Ionization and Reduction of Surface Microbial Diversity of Fresh Cantaloupe

Presenter(s): Trevor Lim, Joshua Jackson, Erika Mendoza, Rebecca Kady

College: Agriculture

Advisor: Bruce Applegate, Kevin Keener

ABSTRACT:

Raw agricultural products naturally contain a diverse surface population of microbial organisms. Cantaloupes, unlike some other agricultural products, rarely undergo antimicrobial treatment before reaching the consumer. The goal of this research was to evaluate a novel technology (ACP-atmospheric cold plasma) developed at Purdue University (Keener et al.), which utilizes an in-package ionization process, in reducing surface microbes on raw, fresh cantaloupe. Previous research has shown ACP eliminated spores (>6 $\log_{10}$), reduced pathogens (3-5 $\log_{10}$ of *E. coli* O157:H7 on lettuce/spinach and *Salmonella* spp. on shell eggs, raw chicken, tomatoes), and extended shelf life. This process indirectly exposed packaged sliced cantaloupe to a high voltage/low power (70 Kv/<120W) ACP field for 120s, followed by 24 h storage at room temperature (21^{o} C). Within 24h, the ozone and other reactive ions generated during ACP treatment slowly convert back to their elemental forms. Measurements included aerobic bacterial reductions, oxygen, nitrous oxides, and ozone concentrations (up to 3,000 ppm generated in 120s treatment). Consequent analysis of the cantaloupe exocarp by BARDOT (BActerial Rapid **Detection** using Optical light scattering Technology), showed a 2-3 $\log_{10}$ reduction across samples from ACP treatment. Results indicated that this ACP process effectively reduces microbial populations on fresh, raw cantaloupe surfaces.

Poster #132/ Life Science

Title of Poster: Design for Cassette Mutagenesis to Alter Substrate Specificity in Acetobacter aceti Succinyl-coenzyme A:acetate CoA-transferase

Presenter(s): Kayleigh Nyffeler

College: Agriculture

Advisor: T. Joseph Kappock

ABSTRACT:

Carboxylates, including succinate and 3-hydroxybutyrolactone, are used in products that range from solvents to fibers. However, a number of these carboxylates are expensive, and they are often made from biomass. An alternative to production of carboxylates through biomass is via enzymatic synthesis. AarC, a succinyl-coenzyme A:acetate CoA-transferase, is an important component of the citric acid cycle in Acetobacter aceti, and naturally produces succinate. With a few clever mutations, we hypothesize that the enzyme could produce alternate carboxylates, with the only major input coming from acetate, a compound that is far easier and cheaper to obtain. To modify the enzyme, AarC with strategically selected randomized codons will be modified through cassette mutagenesis and expressed in ΔSucD Escherichia coli. Clones that complement growth on acetate media will be selected, as this will prove that the mutagenized enzyme is properly folded. Clones that pass this test will then be sequenced, analyzed further, and potentially optimized. A modified DTNB/Citrate Synthase assay can also be used to test for acyl-CoA transferase activity. Mutagenized AarC can be used to provide a new, environmentally friendly method of carboxylate synthesis.

Poster #133/ Life Science

Title of Poster: Blood-CSF Barrier Expresses LRRK2, a Kinase Implicated in Etiology of Parkinson's Disease

Presenter(s): Stephanie Barthuly

College: Health and Human Sciences

Advisor: Wei Zheng; Chris Bates

ABSTRACT:

Leucine-Rich Repeat Kinase 2 (LRRK2) is a kinase implicated in the pathoetiology of Parkinson's disease (PD). Previous investigation on LRRK2 has been conducted primarily in neurons, but little is known about the expression and function of LRRK2 in tissues peripheral to the brain, e.g. the choroid plexus (CP), which constitutes a barrier between the blood and cerebrospinal fluid. This lab has recently acquired evidence suggesting that manganese (Mn)-induced Parkinsonian (MIP) symptoms may be associated with disrupted copper homeostasis and increased a-Syn aggregation in the CP. Since mutations of LRRK2 are associated with PD, there is potential for altered LRRK2 expression and function in the choroid plexus following Mn exposure to contribute to PD. This preliminary study tests the hypothesis that LRRK2 exists in the CP. Our qPCR data demonstrated the presence of LRRK2 mRNA in rat choroid plexus. Further studies are currently in progress, including the use of Western blot to detect LRRK2 proteins and confocal microscopy to visualize the subcellular distribution of LRRK2 in choroidal epithelial cells. These preliminary data will serve as a foundation for future studies on 1) LRRK2 function and role(s) in the CP in MIP and 2) the role(s) of the CP in PD development.

Poster #134/ Life Science

Title of Poster: Mutations Changing Transcriptional Control of the proU Transport Operon in Salmonella typhimurium

Presenter(s): Jennifer Franks

College: Science

Advisor: Laszlo Csonka

ABSTRACT:

In high salinity environments, cells must be able to maintain equilibrium between internal and external osmolality. Accumulation of uncharged solutes is one mechanism for coping high external osmolality. 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 osmolality. 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 by ethyl methanesulfonate (EMS) which is a DNA alkylating agent that produces point mutations. When plated on MacConkey medium, the original strain has a white color indicating that it is Lac-. A mutant strain was isolated that has a red color demonstrating that it became Lac+. 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 is necessary to pinpoint the location of the mutation and its exact nature.

Poster #135/ Life Science

Title of Poster: What's the next step? Pedometers as a tool for quantifying pain in horses

Presenter(s): Cody Schnur

College: Agriculture

Advisor: Dr. Timothy Lescun, BVSc, MS

ABSTRACT:

Assessing pain levels in horses is a difficult task, yet vital to provide effective medical care. Physiological indices, including heart rate, and behavioral signs are commonly used to evaluate discomfort in hospitalized horses. However, a method does not currently exist that reliably quantifies pain in horses. It is currently unknown whether activity may indicate the level of pain experienced by horses recovering from surgery. This study aimed to determine whether simple pedometers could accurately measure activity in horses and whether activity may be considered an objective measure of postoperative pain. Pain-free horses and horses admitted to the Purdue Large Animal Hospital for a variety of surgical procedures were observed. Activity monitors and pedometers were attached to the left forelimb of patients, and pedometer readings were recorded five times daily. Physiological, behavioral, and postural data was gathered twice daily and collected on the day of admission, the day of the surgery, and one day post-surgery. Although no significant correlation existed between horse activity and pain indicators, pedometers were determined to be accurate measures of activity, correlating well with activity monitor data (R^2=.917; P<0.001). Additionally, specific surgical operations consistently presented trends in activity, possibly indicating that particular procedures trigger unique pain sensations.

Poster #136/ Life Science

Title of Poster: Characteristics of ordered and disordered chromatin

Presenter(s): David Tobin

College: Science

Advisor: Arnold STein

ABSTRACT:

Phasograms, counts of nucleosomal DNA sequence read starts versus nucleotide number, can reveal the degree of regular nucleosome spacing due to positioned nucleosomes in a DNA region. We have analyzed the Human K562 cell Nucleosome Signal from ENCODE/Stanford/BYU provided by the UCSC Genome Browser. We computed phasograms in 150 k windows across each chromosome except Y using the nucleosome occupancy data provided by the Table Browser. We scanned across each chromosome at 5 Mb intervals to sample the genome for possible variability in nucleosome ordering in different 150 k DNA regions. We found considerable differences in the extent of nucleosome ordering in different regions of the genome. Highly ordered chromatin tended to be significantly (2.6-fold) enriched in DNA having GC ≥ 40% relative to disordered regions. There was also a significantly higher fraction (0.27) of RefSeq gene deserts in the GC ≥ 40% windows of ordered chromatin compared to the fraction (0.02) in the GC ≥ 40% windows of disordered chromatin. These findings suggest that higher GC content promotes the formation of large ordered nucleosome arrays, and that ordered nucleosome arrays are a characteristic of the gene deserts that have higher GC content. To examine which DNA sequence motifs contribute to the formation of highly ordered nucleosome arrays, we computed phasograms from DNA regions selected based upon our lab's previous experimental work on DNA sequence motifs that influence nucleosome formation in vitro (Takasuka, TE and Stein, A. 2010 Nucleic Acids Res. 38:5672-5680). We previously showed that period-ten TA motifs in certain known sequence contexts have very high affinities for core histones in vitro. Here, we used Fourier analysis across the whole human genome to identify 150 k DNA regions that contained a higher-order periodicity of these period-ten TA motifs that are predictive (based on experimental tests) for the formation of regularly spaced nucleosomes in cells. We then computed and averaged all phasograms from these regions for comparison with the averaged phasograms from control regions lacking the TA signals indicative of regular nucleosome arrangements. We found that the resultant average phasogram from all the DNA regions that contained signals predicted to form regular nucleosome arrays was stronger than the resultant average phasogram from all control regions that lacked these signals. This finding suggests that 150 k regions of DNA having regular dinucleosome period oscillations in certain period-ten TA motifs that were demonstrated to form nucleosomes efficiently in vitro contribute to the ordering of nucleosomes in K562 cells.

Poster #137/ Life Science

Title of Poster: Abundances estimates of Microtus and Peromyscus across vegetation treatments within Indiana prairie habitat

Presenter(s): Cole Bleke

College: Agriculture

Advisor: Dr. Patrick Zollner

ABSTRACT:

Small mammals play important roles in ecosystems, often functioning as both predators and prey. Mice (Peromyscus spp.) and voles (Microtus spp.) are important components in the diets of raptors, mammalian carnivores, and reptiles. Knowing what small mammal species are likely to be found in a particular habitat is critical for understanding population dynamics and interactions between trophic levels. We used mark-recapture data in Program MARK to estimate abundance of Peromyscus and Microtus in prairie habitat at the Purdue Wildlife Area. Specifically, we examine differences in abundance in habitats where vegetation control treatments were applied to promote native warm-season vegetation. Treatment types include untreated, mowed, tilled, or one of three different herbicide concentrations. We will use a Kruskal Wallis nonparametric test based on ranks to test for significant differences in abundance index values between treatments. Index values will be calculated by taking the number of unique animals for each focal species, Peromyscus and Microtus calculated separately, add one, and that sum is divided by the available trap nights. Available trap nights is determined by the total number of trap nights minus the sum of number of trap nights other animals were captured and number of trap nights that traps were sprung.

Poster #138/ Life Science

Title of Poster: Evaluating estimates of temporary emigration in Microtus and Peromyscus species using Robust Design models and Camera Traps

Presenter(s): Jessica Rodkey

College: Agriculture

Advisor: Patrick Zollner

ABSTRACT:

Studies involving robust design have relaxed the assumption of closure within primary sessions to allow for one exit and entry, therefore yielding estimates of temporary emigration. Temporary emigration has never been assumed or evaluated for small mammals using Pollock's Robust Design coupled with extensive live-trapping data To test our hypothesis that both Peromyscus species and Microtus species will temporarily emigrate from a sampled site during a primary session, we collected four years of small mammal live-trapping and one year of camera-trapping. Live-trapping data will be compared with disturbance events and Mustelid presence either in live-traps or caught on the camera trap to test for the strength of influence these environmental variables have on species migration patterns and therefore, estimates. Positive trends for temporary emigration, live-trapping data and camera trapping data particularly in Microtus species could potentially impact the way in which small mammal population fluctuations are sampled and modeled.

Poster #139/ Life Science

Title of Poster: Hospital Efficiency: Quality-adjusted Hospital Productivity Analysis

Presenter(s): Xin He

College: Science

Advisor: Brandon Pope

ABSTRACT:

More than half a trillion dollars are spent each year in the U.S. hospital industry, which alone would rank as the 20th largest economy in the world. Despite the widespread recognition that inefficiencies exist, there is little recent evidence from an industry-wide perspective to speak to the amounts and trends in inefficiency, or the associations of endogenous or exogenous hospital characteristics, such as quality. In this study, we constructed a new longitudinal data set by merging AHRQ's Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) and CMS' Hospital Cost Report Information System (HCRIS) for the years of 2002-2009. The result of our matching process yields a panel of approximately 600 hospitals per year, which represents more than 10% of the firms in the industry. Our model of hospital production includes variables which capture input (labor, capital and other costs), output (inpatient days, procedure types), context (location, market competition, hospital structure and ownership etc.) and quality (differences between estimated and actual costs). In order to produce robust findings regarding trends and levels of efficiency, and the effects of environmental variables, we will utilize a variety of models to analyze the data once our model building is complete, include parametric (stochastic frontier analysis), nonparametric (data envelopment analysis), and semi-parametric (convex nonlinear least squares) models of the production technology. Our results can be used to construct strategies and policies at the firm and industry level to promote efficiency while adjusting for the context and quality of hospital production.

Poster #140/ Life Science

Title of Poster: Computational method for disordered regions during protein docking.

Presenter(s): Arthi Anand

College: Science

Advisor: Dr. Kihara

ABSTRACT:

At recent times, disordered regions in proteins have been known to have important functions in terms of binding, signaling, coactivation and corepression. For our research, we have selected six papers published by Indiana University and IUPUI as primary references. Since these proteins do not have a rigid structure, it is difficult to identify their structures. Our research is focused on developing a new computational method which can be used to predict the structures of the disordered regions during protein docking. During protein docking, the region would be present in the structure that would be most useful in signaling and other functions. After binding of the disordered regions, it may adapt a rigid structure. Thus this would be the appropriate time to predict the structure of the disordered region We have chosen to select the proteins which might have disordered regions on basis of the chain length of the protein. We decided to look into the function of the PONDR-VLXT, software used in the developing algorithms. This would be useful in deciding the algorithm to be used in our method. Hence a complete review of each method and analysis of the results obtained would enable us in developing our computational method.

Poster #141/ Mathematics/Computational Science

Title of Poster: Adaptive Computational Offloading on Mobile Devices

Presenter(s): Armando Ramirez

College: Engineering

Advisor: Yung-Hsiang Lu

ABSTRACT:

Due to the current prevalence of cloud computing resources and an increasing dependence on mobile devices for complex tasks, it is becoming a more common practice to offload computation from mobile devices to cloud servers in order to increase performance. While this technique has expanded the capacity of mobile devices, the decision to offload should not be a unilateral one. It depends on a variety of ever-changing factors, such as network conditions and computational complexity. Ideally, a mobile device would analyze these factors at run-time and dynamically make the decision to offload, thus making efficient use of cloud resources. This research presents a case-study in this adaptive technique using chess artificial intelligence as an example task. Performance measurements are presented to illustrate the factors that affect the offloading decision. The measurements are then used to create a model of offloading performance, which is implemented at run-time to intelligently offload computation. The end result is a mobile application that adaptively and intelligently takes advantage of cloud resources.

Poster #142/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Investigative Analysis of Future Expansions For Cornucopia Farm

Presenter(s): Michael Baird

College: Agriculture

Advisor: Dr. Jennifer Dennis

ABSTRACT:

The goal of this business plan was to identify and implement new, sustainable, and profitable additions for Cornucopia Farm. I wanted to determine which consumer segments to target and find out if the farm could be profitable long term. This is crucial because this plan will be the gauge for the farm's future growth potential. Cornucopia Farm wants to be expand their current operation, because the owners would like their children to come back and be involved in the business. I approached this problem by first going through and describing the current business model. Then I compiled findings from various USDA studies, demographic data from the US Census Bureau, and observational studies to make recommendations on what the farm could do to improve. After going through all of the available data, which included financial spreadsheets, I determined that adding these additions would be a profitable venture for Cornucopia Farm. The business plan has been presented to the business owners, and they are already looking into installing some of these new additions. These are positive implications, because if the farm can function according to the business plan then it will continue to grow and be a sustainable family owned business.

Poster #143/ Humanities/ Social Science

Title of Poster: A Qualitative Approach to Validity Analysis in Instrument Design

Presenter(s): Austin Saragih

College: Engineering

Advisor: Michael Fosmire, Senay Purzer, Ruth Wertz, Amy Van Epps

ABSTRACT:

It is essential for engineering students to possess information literacy and critical thinking skills to solve complex engineering problems. However, the assessment of such complex and ill-defined skills has been a longstanding problem. The objective of this study was to describe a process for using qualitative data (e.g., open-ended response questions) to provide validity evidence for the design of a multiple-choice assessment instrument. We analyzed the Critical Engineering Literacy Test (CELT). For the qualitative analysis, a two-tiered coding protocol was developed to categorize the 11 multiple-choice items with free-response for the current data (N=150). Two raters identified correct responses with reasonable rationales and incorrect responses with conceptual misunderstandings using the coding protocol and establish inter-rater reliability. We calculated the percent alignment for correct and incorrect answers which is the ratio between the number of students with an appropriate reasoning and the total number of students regardless the reasoning. Classical test theory was applied to conduct item analysis and calculated item difficulty and item discrimination. The inter-rater reliability of coding between 2 raters was 85%. In average 89% of the correct answers had appropriate reasoning and 89% of incorrect answers also had appropriate conceptual misunderstandings. This suggests that there is a high alignment between of the open-ended reasoning to the multiple choices. The results show the qualitative protocol supports the results of the classical test theory item analysis. Results of item analysis will be verified by the high alignment to validate whether an item is high functioning or not. This is helpful in designing and/or implementing information literacy interventions.

Poster #144/ Life Science

Title of Poster: Prevention of Airborne and Physical-Contact Disease Transmission through Waste Container Policy

Presenter(s): Elizabeth Rowland

College: Health and Human Sciences

Advisor: James McGlothlin

ABSTRACT:

Recent evidence supports that diseases such as Methicillin-resistant Staphylococcus aureus are found most concentrated in waste receptacles, primarily on the lid surface. There are many waste receptacles requiring one to come into direct physical contact with the lid in order to dispose of his or her waste. Every time individuals use such receptacles, they come into contact with previous users' germs, organic waste matter, and other contaminant found on the lid. Additionally, they are then subjecting their own germs and organic waste matter to reside on the lid, forcing the next individual to come into contact with such residues. This cycle continues and serves as a direct transmission source for viruses, bacteria, and disease spread. There is desperate need for a policy to implement the use of no-touch trashcans throughout public universities. Research was done to gain opinions and perspectives of both trashcan users and building management on Purdue University's campus. Research suggests other no-touch receptacle alternatives such as completely replacing all trashcans, replacing solely the lids of trashcans, or simply phasing out of trashcans not meeting the standards. Such efforts will dramatically reduce the possible transmission of such diseases, ultimately fostering a safer and healthier environment for public universities.

Poster #145/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Residential Evaluation of Biowall for Energy Use & IAQ

Presenter(s): Gabriel Pirtle

College: Technology

Advisor: Prof. William Hutzel

ABSTRACT:

The poster was created to demonstrate the evaluation of energy use and indoor air quality for a Biowall in a home. First of all, Biowall is a novel system for improving indoor air quality (IAQ) in a residential building, which has the potential to save energy compared to traditional air quality control. The Biowall was integrated into the heating, ventilation, and air-condition system of a high performance home and utilized plants as a passive filter system to remove volatile organic compounds (VOC) from the interior space of the home. Secondly, the testing environment in this poster was a 984 square foot efficient residential home constructed for the U.S. Department of Energy Solar Decathlon 2011 competition. A number of sensors were installed in the home to monitor the operation of the wall including temperature, relative humidity, carbon dioxide, and total volatile organic compound (TVOC) sensors. Finally, the main outcomes of the evaluation process included the specific data of the amount of energy that might be saved and how the IAQ would be improved because of the impact of Biowall. However, preliminary data shows that the prototype Biowall increases energy use for air conditioning while maintaining acceptable levels of IAQ. The increased energy use is linked to increased levels of latent energy, in other words, humidity given off by the Biowall. These somewhat disappointing results do not necessarily discredit the overall Biowall concept, but they do suggest that improvements to the Biowall control strategy are needed to achieve expected performance levels.

Poster #146/ Life Science

Title of Poster: N-acetylcysteine: A Possible Treatment for Hair-Pulling in Trichotillomania

Presenter(s): Anusorn Mudla

College: Agriculture

Advisor: Amy C. Lossie

ABSTRACT:

Trichotillomania (TTM) is a human body-focused repetitive disorder found in ~4% of women. Patients with TTM pluck patches of hair, which often leads to depression and anxiety. Barbering is a validated mouse model of TTM, and is characterized by hair and/or whisker plucking of self and cagemates. The most effective treatment for human hair-pulling is N-acetylcysteine (NAC). NAC, the main precursor to glutathione, is a fundamental antioxidant that protects the brain from reactive oxygen species (ROS). ROS accumulate through cellular metabolism, damaging lipids, DNA and proteins within and among nearby cells. ROS increases oxidative stress, which can cause neurons to enter a low metabolic state to avoid apoptosis. Our objective is to study effects of NAC in mice to understand disease pathophysiology, identify diagnostic biomarkers and develop effective treatments. We hypothesized that NAC therapy helps in barbering by increasing antioxidant defense mechanisms, which in turn decrease ROS. In this study, C57BL/6 barbering mice (N=28) were housed with normal mice and given water with or without NAC. We collected urine from each mouse at 0, 12 and 24 weeks and tested for two independent measures of oxidative stress, DNA damage (8-hydroxy-2-deoxyguanosine), and total antioxidant capacity. We recorded individual body weight and barbering maps biweekly to monitor barbering patterns. After 24 weeks, we euthanized animals and collected pre-frontal cortex, rest of brain, spleen, liver and blood. Urine antioxidant measures indicate that there is a correlation between the level of ROS and barbering behavior, suggesting that ROS is a possible biomarker for TTM. Currently, we are conducting transcriptome studies to identify the genetic and biochemical pathways that are disrupted in barbering animals, and testing urine-based biomarkers in blood and brain. We expect that these studies will facilitate the discovery the mechanisms underlying barbering behavior in mice, and will use this information to design further strategies to treat TTM in the human population.

Poster #147/ Innovative Technology/Entrepreneurship & Design

Title of Poster: Purdue Electric Light Sport Aircraft

Presenter(s): Holly Tanner, Steve Carcamo

College: Technology

Advisor: Sergey I Dubikovsky

ABSTRACT:

Due to the recent surge in the propagation of greener technology and rising fuel costs, the general aviation industry's sensitivity to emissions and operating costs are increasing worldwide and threatening the supply of private pilots. With recent advances in battery technology, an electric aircraft powered solely by batteries is a possibility in the general aviation industry and can most certainly be achieved by detailed design and funding. This lead us to believe that we can take the next step forward in mounting an electric engine to a test stand and airframe to prove to the aviation industry that an all-electric light sport aircraft is possible. In order to market and fund such a project we first gaged general awareness of the Purdue Electric Light Sport Aircraft (PELSA) Project by conducting two surveys, one at Purdue's airport and the other on campus, and found that no one is aware of the project. We will use the result of these surveys as a baseline for judging progress in marketing and creating an electric aircraft. The implementation of an electric aircraft into the general aviation industry and pilot training courses will increase the number of future pilots and reduce harmful emissions.

Poster #**XX**/Humanities Social Science

Title of Poster: A Resource Allocation Approach to Patient-Centeredness in Primary Care

Presenter(s): Ravindran Rajesvaran

College: Science

Advisor: Dr. Brandon Pope

ABSTRACT:

The Institute of Medicine (IOM) defines patient-centered care (PCC) as "providing care which is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions". Patient-centeredness (PC) is important as it is an ideal that is one of the IOM's six aims for 21st century healthcare. Accordingly, the problem of how to quantitatively measure patient-centered care arises. This research project sought to develop a gap-based measure of patient-centeredness using resource allocations in the form ternary plots to capture preferences among 3 different dimensions of primary care: Education and Prevention, Diagnosis and Treatment as well as Monitoring and Management. It also sought to identify patient and physician characteristics that could explain these gaps using one-way analysis of variance tests. Analyses to verify if the gap-based assessments were related to more typical assessments of patient-centeredness were also conducted. Surveys were administered at a primary care clinic and residency training center to patients and physicians where they plotted several of their resource allocations for primary care visits according to their perceptions of patient's wants, needs, and care received (delivered) and PC measures were developed using the gaps between these plots. The results indicate that there are significant differences among physicians with respect to adapting to the patient's wants, needs and care delivered. This gap-based PC measure has potential that can be studied further.

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