The Office Of Undergraduate Research & Creative Inquiry

Presents the

18th Annual Developing Scholars Program Research Poster Symposium

April 15th, 2018

K-State Student Union Ballroom

A FUTURE OF DIVERSE EXCELLENCE

THE DSP DIFFERENCE

Abstract Booklet

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Safety and Security Implementation on Cyber-Physical Systems

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Our goal is to create and evaluate an easy-to-use process, augmented with an analysis toolset, for safety engineers to be able to incorporate security into the overall safety design, since a security problem is frequently a safety problem as well (but not vice versa). We use the results to test a safety and security co-design and reasoning methodology applied to designs of cyber-physical systems in general, focusing on health-critical medical devices like infusion pumps, insulin delivery systems, and implantable pacemakers and defibrillators. We start with the Open Source AADL Toolset Environment (OSATE), which uses the Architecture Analysis and Design Language (AADL), which is targeted at model-based safety engineering. Model Based Engineering (MBE) is a software and systems development technique that uses detailed visual modeling to help design and analyze real-time embedded systems. Many systems have not only safety but also security assurance requirements, making MBE an ideal choice for integrating safety and security into a single design process. However, AADL is designed primarily for safety engineering, making security analysis challenging, and often requiring a separate process. This can lead to disconnects between safety and security requirements, potentially compromising both as a result. We study safety and security co-design, augmenting OSATE to assist with further creation of models and systems that maintain safety properties while taking security into account as a "first-class citizen" rather than an after-the-fact concern.

Stories of Resistance & Resilience: Indigenous Hip Hop in the Heartland

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Hip Hop tends to be widely recognized as a genre of music. However, hip hop can also be understood as a full cultural movement, complete with its own specific fashion, language, art, goals and values. Examined this way, hip hop can be validated as a form of resistance that operates within a "landscape" within which people and products might fit or not. This landscape is defined by a certain parameter of aesthetics determined by the people within that goup. Although this landscape is usually recognized as only functioning within the Black community, we studied its presence and existence as it pertains to Indigenous and Native American communities. The research goal for this poster is to determine if there is an existing Indigenous hip hop landscape and the likely cultural "fit" of such an aesthetic in Kansas locally. As part of an ongoing project, we have used a preliminary review of literature, primary data (interviews) and secondary data (found theater productions, scripts and recorded storytelling sessions) examined through a tribal, feminist, critical race-centered lens. This poster relates findings on the parameters which might bind the Indigenous hip hop landscape in Kansas, and if it is not, where there is space within Kansas art and activism to hold Indigenous hip hop. Following these findings, we end with an idea of the presence or absence of Indigenous Hip Hop in Kansas. The poster aims to create a space to begin conversation about the possibility of that landscape.

One-Step Synthesis of Water-Soluble Core-Shell Indium Phosphide Quantum Dots

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During the last two decades a great variety of synthesis methods have been developed, yielding quantum dots with different properties. To synthesize highly luminescent quantum dots, it is necessary to use cadmium or other heavy metals. Unfortunately, such metals are harmful for living organisms, which reduces their applicability in the biomedical field. Indium-containing quantum dots emerged as an alternative and showed lower toxicity. Both types of quantum dots have a low solubility in polar solvents. With the understanding of such particles and previous findings, it was concluded that the best way to synthesize high quality quantum dots and preserve their properties was to grow a shell on them. By creating a shell, the core can be protected from the polar-solvents electrostatic influences and avoid any leak of heavy metals if used. For this research, we conducted a literary review on Indium Phosphide nanocrystal precursors and zinc sulfide shell growing. Then, a one-step synthesis was designed to reduce risk of contamination: the amounts of reagents were calculated and placed in a vial where the heating source was a microwave. First, a pilot trial confirmed that the formation of Indium Phosphide core was possible under these conditions. Second, by using different time settings and reagents we tried to find the right combination to synthesize the most stable shells. The presence of a core was confirmed by UV-Vis analysis. However, none of the analysis showed evidence of the presence of a ZnS shell. In addition, the samples displayed a low luminescence and solubility in water. For the future, we will use different time settings for the heating process and a fluorine-containing ionic liquid to provide a more stable reaction environment.

Mesoporous Silica Nanoparticle Synthesis and Drug Loading

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Mesoporous silica nanoparticles, or MSNs, are versatile drug delivery systems that can uptake a variety of drugs. Traditionally, MSNs are synthesized using a multiple step process where Cetyl trimethylammonium bromide (CTAB) is used as a template for tetraethyl orthosilicate (TEOS). After the synthesis of the actual MSN around this template, the toxic CTAB is removed by means of a washing procedure. This empties the pores to make room for the desired drug. The now mostly empty MSNs are put in a solution that is highly concentrated with the desired drug. In contrast to the classic approach, we use a simple one pot synthesis to make our MSNs. The desired drug is used as a template for TEOS and (3-Aminopropyl)triethoxysilane (APTES) to form around and make the MSN. With this method no other steps are needed as the drug is already loaded into the MSN and there are no overly harmful chemicals to wash the template away. The produced MSNs are characterized using Thermogravimetric analysis (TGA), Dynamic light scattering (DLS), Zeta potential, and tested against the model pathogen *Micrococcus luteus* on plates and in solution to test for their effectiveness in killing bacteria. All synthesized MSNs that will be accepted by the body have a positive outside charge and the loaded drug is on average 20% of the MSNs total weight. Its effectiveness in killing or inhibiting the growth of *Micrococcus luteus* depends on which drug is loaded inside of it. In the future, functionalization of the outside of the MSN will be performed to see if release of the loaded drug can be controlled, increase biocompatibility, or further target certain kinds of cells in the body. MSNs are diverse and hold the potential to carry various drugs that would otherwise be harmful to the targeted cells infecting the body.

Advantages of Air Cooling in Thermal Ablation

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Thermal ablation is the method of destroying tumors through the application of extreme temperatures. For this experiment, heat is used and supplied by an amplifier/power generator. The heat is transported out through a catheter device and into the designated area of the tumor. Cooling the tip of the device can be used to control this heat in effort to expand the ablation size and cut down on the destruction of unwanted tissue. Thus far, water has been the primary strategy used for cooling. The practice of using an air-cooling device to improve thermal ablation has shown to be beneficial. Its effectiveness compared to water cooling and no cooling will be evaluated in this experiment. An air-cooling device has been created at 2.45 GHz. It will be tested ex vivo on pieces of meat and compared to the results of thermal ablation with water cooling and with no cooling at all. The air-cooling device is expected to show improved results compared to the other methods. This is due to air's ability to deliver more energy to tissue as well as air requiring less space, thus allowing for a smaller needle for insertion. The goal is that these air-cooling devices will produce a much larger ablation zone while being less invasive and more time efficient than a device with water cooling or no cooling. In finding that air-cooling is a much more improved method over water cooling, doctors practicing thermal ablation will be able to target a varying amount of tumors in a safe and timely manner.

Boron Uptake in Salt Cedars via Aquaporins

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Salt Cedar (Tamarix) is a dicot plant highly tolerant to the chemical boron. This is important as most plants are not tolerant and boron is a toxic metalloid which is difficult to clear. The goal of the project was to identify a potential protein sequence (order of amino acids forming a protein) for an aquaporin to compare to samples of sequences we get from our upcoming lab results. In addition to determining the sequences, a 3D model of the potential protein is currently being made to see how boron is entering the cells through the channels of these proteins. The methods consist of a literature review and creation of 3D models of these channel proteins using computer software programs that build models based on the sequences which determine the protein's structure and function. Currently, a potential sequence has been found to compare to the Salt Cedar results and modeling the protein's structure has commenced. The diameter of the channel is a critical value being calculated. This value determines whether or not boron will fit through the channel. Expected results: these sequences will not be highly expressed in Salt Cedar roots, thus helping the Salt Cedar prevent boron uptake. This is a multifactorial approach to determining why the Salt Cedar is tolerant to boron, examining how it responds specifically to boron. This research is critical as plants are currently facing boron tolerance issues across the world and particularly within the southwest region in the United States.

The Redesign and Construction of a Compact Inverted Pendulum Cart

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In 2012, Dr. Warren White and his controls lab team created Kansas State's wireless inverted pendulum cart, AKA "Wally." The four-wheeled cart uses a control system to balance the inverted pendulum, an underactuated mechanical system. If the pendulum falls in one direction (either forward or backward), the cart will roll in that direction to prevent it from falling, analogous to balancing a broom stick, vertically, in one's hand. The current cart is large, one of a kind, and difficult for a large number of students to use at once. The purpose of the project is to create a smaller, less expensive version of the inverted pendulum cart so that students will be able to test the dynamics of their controllers on their lab station tabletops. The greater number of carts would allow for a more efficient utilization of class time. The new cart, nicknamed "Junior," was designed using the program SolidWorks, with many of the parts 3-D printed or purchased from hobby robotics websites. The on-board computer is the myRIO, a micro-controller, from National Instruments. The intended result will be a working prototype that will be further tested to determine the viability of a cart at every lab station. We are currently designing and testing the second "Junior" prototype. During testing of the first model, it was discovered that the front wheel slipped, calling for a redesign of the cart. In addition to making changes to the 3-D models, the dynamic equations were also reanalyzed to ensure that the carts didn't slip again. Both a three-wheeled model and a four-wheeled model are being considered for the second prototype. The goal is to have nine inverted pendulum carts for classroom use.

ASSESSING ARCHITECTURE STUDENTS' "ITMC" AND EMOTIVE RESPONSES DURING DESIGN TASKS

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This experiment seeks the physiological response, understood as the anatomic nervous system, to architectural design-related tasks between second year (new to their architectural education) and fifth year architecture students (at the end of their education). By issuing the same stimuli to early and experienced students, we reveal emotive or stress responses and discover any such discrepancies that coincide with a Kansas State pedagogical experience in design. The design tasks will be of two forms: 1) a creativity test in the style of the "Panamericana" Creativity Test; and 2) an iterative test utilizing a repetitive system that requires varied solutions to the same formal inquiry. Consequently, our experiment emphasizes not the definitive results of the creativity tasks but rather the biological changes (arousal) experienced when the participants are exposed to specific design tasks that include: two creativity tests and a process of four iteration tasks. The tasks will be recorded using the BioGraph Infiniti System's temperature-measuring tool, Galvanic Skin Response (GSR), Electromyography (EMG). We expect to find a specific signature with a difference in amplitude when the subject exhibits arousal and enters a creative frame of mind. Because fifth year architecture students have more experience in design thinking, the tasks will present themselves as more enjoyable rather than challenging, causing fifth years to enter a creative frame of mind more quickly than second year architecture students.

The Relationship Between Economic Prosperity and Infrastructure in Ethiopia

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Ethiopia is one of the oldest countries in the world, yet its economic prosperity suffers. Economic prosperity refers to *having the necessary economic resources to fulfill citizens' needs and many of their desires.* "Ethiopia is undoubtedly making enormous development progress, particularly in terms of infrastructure, education and improved livelihoods. Yet there is growing disagreement on what constitutes good or appropriate development for Ethiopia" (Habermann, 2011). Ethiopia is ranked 119 out of 149 in economic quality by prosperity.com. Economic quality measures countries on the openness of their economy, macro-economic indicators, foundation for growth, economic opportunity, and financial sector efficiency. Economic prosperity is a growing problem in Ethiopia due to the proximity gap that is happening in Ethiopia and in Africa in general. In other words, economic agents are not in contact with each other. Thus, the primary goal of this research is to analyze how economic prosperity and the quality of transportation affect each other in Ethiopia. Given the lack of good roads and the absence of navigable waterways in this land-locked country, farmers lack access to big cities to sell their produce. Since there is no efficient transportation means, farmers lack the motivation to produce more than they consume due to their inability to evacuate their produce to the markets. By not producing at maximum capacity, the country is losing essential earnings from agriculture. As a result, Ethiopian imports are outpacing their exports with negative social consequences. With better management in the transportation sector, Ethiopia has the potential to meet its internal demand for essential products and be competitive in the world markets.

Reviving Troost: Using Phytotechnology to Decontaminate Troost Avenue's Vacant Lots

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Kansas City is a divided city, split along its north-south axis by Troost Avenue. Most African-American residents live on the east side of Troost, while on the west side are primarily white and upper-middle class residents. Troost Avenue was once an attractive and desirable place to have a business. Today, the street is run-down with many vacant lots and buildings and exclusively serves as an artery of the local bus route. My aim is to find a way to improve Troost's streetscape in an attempt to unify the city aesthetically and culturally. The question that drives this project is: what design interventions could bring Troost Avenue back to being an asset for the community? To answer this, I have done archival research at Kansas State University and the Kansas City Public Libraries to better understand the role of Troost Avenue in the past. I have also delved into the world of phytotechnology via the book "Phyto: principles and resources for site remediation and landscape design." Phytotechnology is a design tool that uses vegetation to contain or prevent the movement of contaminants in soils, sediments, and groundwater. With this information, I am proposing a demonstration at the corner of Troost and Linwood to show how the existing vacant lots could be improved to better meet the expectations of the community. This entails documentation of the current conditions of the street and a proposed design for improvements.

Schedule Management Using Virtual Reality Construction

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The goal of this project was to research the new technology in virtual construction for schedule management. Virtual construction is changing how the construction process works. This technology helps create and manage information in the construction process before, during, and after construction. The research was gathered from literature reviews on virtual construction. One company studied is a small startup technology company in Wichita, KS. The literature reviews show that virtual construction for schedule management will make a tremendous impact on the future of the construction scheduling process. The technology allows contractors to enter and interact with the contents of a full-scale computerized model to determine the best installation sequence for components. This reduces the amount of time by reducing complications. This data is entered into a data sheet that captures resources, time, and dependencies associated with each scheduled activity. From that, an automated plan is generated to create the most efficient workflows. A daily task list is created for the contractor to see and complete tasks. Every schedule changes, and with this technology, construction schedules can be updated to reprioritize the remaining work. Because of this, complex plans and schedules are broken down into hours and days, not weeks and months; thus, creating a more reliable and efficient schedule. By reducing workspace conflicts and other problems that typically surface during construction, the technology helps to deliver the project on schedule, benefitting both the contractor and the owner. The technology reduces project delays, enhances visualization, and creates a more efficient schedule.

Rapid Annotation in Learning to Filter Documents for Information Extraction

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This work focuses on information extraction from documents, some of the most popular uses of which are to expand and maintain document databases and to discover knowledge from collections of new documents. A fundamental problem in information extraction is that of the *filtering documents* to obtain those of specified type, structure, and content. In our previous project, we considered the task of *learning to filter,* using a machine learning system to classify documents based on whether they meet type, structure, and relevance specifications, and presented an approach in which training data was produced by labeling documents by hand, also known as manual annotation. The overarching goal of this research is to create an automated pipeline for information extraction and exploratory search, especially of open-access documents and other documents on the web, in the domain of materials science. The information retrieval objective is to find documents dealing with synthesis of the desired nanostructures, extract sections containing reactants and operations needed to produce them and construct procedural recipes for them. Documents that pass the learning filter are marked up by section, to capture entities and relationships. This markup is currently performed by subject matter experts and one goal of this work is to help automate it using machine learning. The specific focus of this work is a user interface to make the annotation task faster and more reliable. We present usability improvements to the user interface and evaluated them with the objectives of speedup without loss of precision, recall, or accuracy.

Action Recognition in 3-D Video Data of Animal Subjects Using Deep LSTM Networks

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Action recognition from 3-D video data remains a crucial and challenging problem in computer vision. Current research focuses on using recurrent neural networks (RNNs) for recognizing human action using the trajectories of human skeleton joints. However, there is a lack of research in action recognition for animal subjects; advancement in this area could help develop a tool for researchers to analyze video data of their animal models. In this work, our goal is to develop a Long Short-Term Memory (LSTM) recurrent neural network (RNN) for dense trajectories and skeleton-based action recognition for animal subjects. From video data, the LSTM network extracts feature representations and models the subject's motion based on the time-referenced sequence and trajectory of skeleton position. To train the LSTM network, we will use rodent behavior video data in a Forced Swim Test (FST), an animal model to test the efficacy of antidepressant drugs and extract motion vectors from the videos. To ensure transferability across different species and motion experiments, we will also train the model with a home pet and develop a user interface to facilitate training of the network. Our future goal is to apply the network in order to recognize action from real-time video data by calculating joint positions from live video stream using the Kinect Motion Sensor. Potential applications of action recognition of both human and animal subjects can facilitate various applications, such as video surveillance, automated narration of videos for blind people and scoring animal behavioral data.

Visualization of Rift Valley fever virus nucleoprotein by immunohistochemistry

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Rift Valley fever virus (RVFV) is a mosquito-borne, zoonotic virus in the *Phenuiviridae* family, genus *Phlebovirus*. Outbreaks cause abortion storms and death in neonatal ruminants, and RVFV also has the ability to cause severe sometimes fatal disease in humans. In the US, RVFV is a CDC and USDA overlap Select Agent and work with virulent strains must be conducted in high containment. Consequently, assays that can be conducted outside high containment on inactivated samples such as the RVFV viral antigen immunochemistry for cattle liver presented here are valuable. Formalin-fixed, paraffin-embedded, uninfected and RVFV-infected cattle liver from a prior RVFV cattle challenge model development study was sectioned at 4 µm onto positively charged slides, deparaffinized in xylenes and rehydrated through graded ethanols to distilled water. All steps were performed at room temperature and followed by TBS 1x with 0.01% tween-20 washes. The slides were heat antigen retrieved in pH 6 citrate buffer then blocked with 3% H2O2, avidin, biotin, and horse serum. Mouse monoclonal anti-RVFV nucleoprotein (clone 09F04) (MAB240P, Maine Biotechnology Services) diluted at 1:500 was applied, detected using an avidin-biotin complex technique, visualized with 3,3'-diaminobenzidine (DAB) and counterstained with hematoxylin. Slides were dehydrated and mounted in Permount. The reagent control included use of an IgG2a concentration matched isotype control antibody (X0943, DAKO). RVFV antigen was successfully visualized in locations correlating to RVFV histopathology. This immunohistochemistry assay is a useful tool for RVFV diagnostics and pathogenesis and vaccine research.

Recipe Extraction of Nanomaterials from Scientific Literature

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This research aims at using machine learning to improve the process of extracting procedural information from text: specifically, the reactants, operations, and physical conditions of chemical reactions designed to produce specified nanomaterials. We refer to instructions consisting of these ingredients and steps as *recipes*. Our research centers around the following tasks for the extraction of recipes from scientific papers: first, gathering documents from open access web archives or publisher sites; next, filtering them to determine which ones are scientific papers; then ranking them by relevance; and finally, dividing them into meaningful sections and extracting structured information about the specified ingredients and steps. This project is further focused on developing dictionaries of chemical terms and pattern matching algorithms for these terms and formulas, in English and in chemical notation, in order to capture training data for machine learning. After training, the learned models can then be used to filter documents for relevance, rank them by relevance and other priorities, extract sections of a paper that are responsive to a search query, and express recipe steps as tuples in a database. The approach taken in this work uses background knowledge from nanomaterials experts at a partner group at Lawrence Livermore National Laboratory; this information is referred to in artificial intelligence research as *domain-specific*. Our experiments consist of using machine learning on collections of expert-labeled documents with two types of objective measures: first, the precision (ratio of true positive to reported positive rate) and recall (ratio of true positive to total positive rate) of documents passed by our learning filter; and second, that of tuples returned in response to an interactive search for recipes for particular nanomaterials and morphologies. Preliminary results show we that can extract the experimental sections and we are continuing to explore the domain-specific entities that account for these gains.

A Case Study of Wind Development Potential in McPherson, Kansas

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The following research is a case study of the potential siting of a 100 MW wind farm in an area northeast of McPherson, Kansas. The research came about from a U.S. Department of Energy sponsored collegiate technical competition. The research is based on previously found wind resource data, interactive maps interfaces, qualitative observations at the potential site, and the WindFarmer software that allows us to create a computer model of the proposed wind farm site. We researched and found the site that we are going to study. Preliminary observations indicate the sight is promising. However, some issues in nearby cities require us to analyze noise effects, animal habitats, plant ecosystems, land use, and the visual effect of the turbines on the surrounding terrain. Our initial findings have shown that while these obstacles are present in our site, they can all be mitigated and managed so not to cause significant harm to the surroundings. Each of these issues are major factors in the selection process of a wind farm site. In conclusion, the research will provide a complete example of how wind siting is conducted and the many variables that must be considered before installing the first turbine.

Typologies in Architecture Form | understanding form complexity

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This research posits a new interpretation of typology in architecture: one primarily concerned with the evolution of contemporary forms. This begins by looking to the complex formal language of prominent architects today such as Bjarke Ingels Group, Zaha Hadid, Steven Holl, Diller Scofidio, and more to begin to dissect and understand what governs their making.

A contemporary survey identifies emerging form typologies. What these form typologies allude to is a new dialogue between the architect, form, and technological advancement within the last 15-20 years. Merely identifying form types does not lend full formal understanding. The question then being: how to understand architecture as a singular entity living within the context of a type? Christian Norberg-Schulz, in *Intentions in Architecture* defines the word "element" as "a characteristic unit which is part of an architectural form" (Norberg-Schulz, 133). This becomes the foundation from which the research defines for itself elements to begin tracing the evolution and morphological operations of a work of architecture. This resulted in a process of questions to be answered by the work: how the building touches the ground, how are apertures created, in what ways or how does light play a part, etc. The methodology emphasizes the diagram as a tool to begin to answer these questions.

This research interprets design processes to communicate contemporary architectural designs. It fills a gap in design vocabulary and defines strategies of designing that have been, for the most part, without a clear stylistic definition.

Synthesis of Carbon Nanotube-Based Photocatalysts for Environmental Remediation

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The design of catalysts for growth of carbon nanotubes is studied to develop recipes and mechanisms for controlled and scalable growth of carbon nanotubes (CNTs). The objective of the study is to tune the photocatalytic properties of titanium dioxide (TiO2) by coupling to CNTs of different properties. Metallic CNTs that are coupled to TiO2 have been shown to act as an electron sink, thereby inhibiting electron-hole recombination and enhancing photocatalytic degradation of environmental pollutants. To achieve our objective, scalable amounts of CNTs with well-defined properties are required. In this study, we explore growth of CNTs under various conditions, including: substrate, catalyst, feedstock, annealing, and prereduction treatment. This is to establish correlations between CNT properties and growth recipe during the chemical vapor deposition. The synthesized CNTs will be coupled to TiO2 nanoparticles and the resulting composites tested as photocatalysts in NOx degradation.

Effects of Gap Junction Enhancers in Human Pancreatic Cancer Cells

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According to the American Cancer Society, approximately 53,070 people in the U.S were diagnosed with pancreatic cancer in 2016. Estimated 71% of these patients will die within the first year. This type of cancer has been challenging to treat due to the complexity of tumor cells, tumor aggressiveness, current drug availability and drug delivery. Thus, the goal of this project is to provide a new approach to treat pancreatic cancer, including combination treatment of novel drugs as well as existing antineoplastic drugs. One approach is to increase cell communication of pancreatic tumor cells using small molecules and hence allowing antineoplastic drugs to effectively travel from cell to cell. A small molecule of gap junction enhancer, known as PQ1, in combination with antineoplastic drug, 5-Fluorouracil (5-FU), was used to test this approach. The results show that 5-FU significantly decreased the expression of gap junction protein, connexin 43, compared to control and PQ1 treatments. Literature suggested that pancreatic cancer cells with intact gap junctions are less aggressive due to the expression of Cx43 on the cell surface. PQ1 has demonstrated to increase Cx43 expression and increase 4.5-fold of gap junction activity. Based on these observations, the possibility of 5-FU for treatment is not recommended and it has a potential to drive these cancerous cells toward metastasis. Overall, the project provides an initial insight to a new approach in treating pancreatic cancer via Cx43 expression.

COPPER-BOOSTING COMPOUNDS: THE EFFECTS OF COPPER AND ITS ANTIMICROBIAL PROPERTIES

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Transitional metals have long been recognized for their cellular inhibitory properties. Metals such as manganese, iron, cobalt, and copper - just to name a few - display antimicrobial characteristics and are naturally found in the human body in trace amounts. Out of all transitional metals, copper is the most effective.

Research in the Bossmann group comprises the synthesis of a series of novel compounds with NNSN-motif. We determine their binding constants with copper(I) by means of UV/Vis-absorption spectroscopy. Upon addition of copper(I), typical novel UV/Vis-absorption bands are formed, which are then analyzed. We envision a 5000 to 25000 per mole binding constant of copper to organic compounds with NNSN motif, since this is the best estimated copper- constant for copper(I)-binding within activated phagosomes. If the binding constant is too low nothing happens; if the binding constant is too high, copper is removed from proteins causing systemic toxicity in the body. This strategy holds promise against multi-resistant bacteria, because it permits both, evading bacterial copper-efflux pumps, which remove copper from the bacteria, and aiming at novel therapeutic targets. To date, humankind is losing the fight against multi-resistant bacteria. Therefore, novel strategies are urgently needed.

The Redesign and Construction of a Compact Inverted Pendulum Cart

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In 2012, Dr. Warren White and his controls lab team created Kansas State's wireless inverted pendulum cart, AKA "Wally." The four-wheeled cart uses a control system to balance the inverted pendulum, an underactuated mechanical system. If the pendulum falls in one direction (either forward or backward), the cart will roll in that direction to prevent it from falling, analogous to balancing a broom stick, vertically, in one's hand. The current cart is large, one of a kind, and difficult for a large number of students to use at once. The purpose of the project is to create a smaller, less expensive version of the inverted pendulum cart so that students will be able to test the dynamics of their controllers on their lab station tabletops. The greater number of carts would allow for a more efficient utilization of class time. The new cart, nicknamed "Junior," was designed using the program SolidWorks, with many of the parts 3-D printed or purchased from hobby robotics websites. The on-board computer is the myRIO, a micro-controller, from National Instruments. The intended result will be a working prototype that will be further tested to determine the viability of a cart at every lab station. We are currently designing and testing the second "Junior" prototype. During testing of the first model, it was discovered that the front wheel slipped, calling for a redesign of the cart. In addition to making changes to the 3-D models, the dynamic equations were also reanalyzed to ensure that the carts didn't slip again. Both a three-wheeled model and a four-wheeled model are being considered for the second prototype. The goal is to have nine inverted pendulum carts for classroom use.

Role of Endocytosis in Iron Uptake by Insect Cells

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Iron plays an important role in energy metabolism and other essential physiological processes. However, because iron can also be toxic, its uptake by cells must be strictly regulated. In humans, there is a well-understood pathway of iron uptake and multiple poorly understood pathways. How iron is taken up by insect cells is unknown. A better understanding of this pathway in insects could lead to better insect control strategies and also provide insight into the less understood iron uptake mechanisms of humans. The purpose of this project is to determine if endocytosis is involved in iron uptake by *Drosophila melanogaster* (fruit fly) cells. The strategy was to block endocytosis and measure the effect on cellular iron content. Double stranded RNA (dsRNA) was synthesized and used to induce RNA interference (RNAi) of rab5, a protein necessary for endocytosis. Green Fluorescent Protein (GFP) was used as the negative control because it is not expressed in fruit fly cells. A sample of fruit fly cells was left untreated to serve as another control. Fruit fly cells were either treated with rab5 or GFP dsRNA to induce RNAi or were left untreated. Then, the amount of iron in cells was measured via a ferrozine assay. Results for the first biological replicate showed that cells treated with rab5 dsRNA had less iron per mg of protein than cells treated with GFP dsRNA or untreated cells. More biological replicates will allow statistical analysis of the data. The results of this first trial suggest that treating fruit fly cells with rab5 dsRNA reduces their iron uptake. This could indicate that endocytosis plays a role in iron uptake by fruit fly cells.

Detection of anti-staphylococcal activity by utilizing copper-dependent inhibitors with an extended thiourea group

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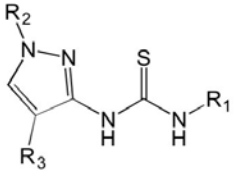
Multi-drug resistant bacteria are proving to be a major problem for the health care system. Current drug discovery screenings have failed to produce proper antibiotics for methicillin-resistant *Staphylococcus aureus* strains (MRSA). Copper has been proven to activate antibacterial properties of copper-dependent drugs that inhibit the growth of MRSA. We have developed a new drug discovery screening method that utilizes the properties of copper in order to distinguish anti-staphylococcus copper-dependent compounds. The screening of 10,000 compounds for anti-staphylococcal activity in copper revealed 53 of 129 active compounds exhibiting copper-dependency. The findings of an extended thiourea group called NNSN motif on copper-dependent compounds, resulted in copper-dependent and copper-specific inhibition of *S. aureus*. These compounds have been found to display effective anti-MRSA activity. Therefore, by developing a copper-based screening, we have discovered that copper-dependent compounds that contain NNSN, can be used to inhibit the growth of MRSA. The second step of this endeavor consists of the synthesis of multiple compounds with an extended NNSN motif. This research is guided by the paradigm that by systematically varying the substituents R1, R2, and R3, which have been identified as essential, an optimal drug candidate can be found. The activity measurements are being performed by Dr. Wolschendorf and his team at UAB.



Compound with NNSN motif. In phase 1 of this synthetic effort, substituents in positions R1, R2, and R3 will be systematically varied.

Identification of an Insect Cuticle Degrading Protease

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Insects have an outer skeleton known as an exoskeleton or cuticle. However, this limits how big they can grow. Therefore, they need to shed their old exoskeleton and synthesize a new one in order to continue growing, a process known as molting. To do this, insects produce a fluid that helps to degrade the exoskeleton. Enzymes found in this molting fluid are critical for this process. One of these enzymes is known as Molting Fluid Protease 1 (MFP-1). A protease is an enzyme that breaks down other proteins. This enzyme has been previously purified and shown to be similar to the blood-clotting enzyme thrombin, however, the gene for this protease has never been identified. Our goal is to identify the gene coding for MFP-1. In order to accomplish this, we collected molting fluid from the insect and purified MFP-1 following a previously published procedure. This was achieved by utilizing distinct properties of MFP-1, namely its ability to bind to the complex sugar heparin. Two rounds of heparin purification were performed, in which progress was monitored by performing assays for enzymatic activity. From this purification, activity was seen in two separate fractions suggesting there could be two enzymes. We are currently testing both of these fractions to determine their properties, such as at what pH the enzyme is most active, what proteins is it likely to break down, and what chemicals inhibit and disrupt protease activity. The next step will be to analyze candidate proteins by the method of peptide mass fingerprinting. With this technique, a protein is cut into smaller pieces with an enzyme that produces a unique pattern of peptide fragments. A virtual digest is performed on the proteins in the genome which produces a unique pattern, or "fingerprint", for each protein. The fingerprint from the protein digest is compared to each fingerprint produced by the virtual digest and statistical analysis is used to identify the best match.

Wastewater Denitrification Using BHN-Probiotic Solutions as an Alternative External Carbon Source

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Reducing the amount of Nitrogen found in wastewater is a crucial step for wastewater treatment plants, and denitrification is an essential biological step that could be rate-limiting. To reach the stringent nutrient discharge standards, treatment plants commonly use methanol as an external carbon source; however, there are many safety issues that can arise from using methanol. This problem prompted the study to find and compare other sustainable and environmentally-friendly carbon sources that could potentially be used by wastewater treatment plants as a replacement for methanol, while still maintaining low nitrogen levels. For this study six different carbon sources were evaluated: MicroC, methanol, acetate, product A, B, and C from BHN – Probiotic Solutions ®.

Various batch denitrification tests were conducted using biomass from two different wastewater treatment plants located in two different climate regions (Manhattan, KS and Mesa, AZ). One of these treatment plants was acclimatized to methanol (Mesa), while the second had no external carbon addition. Parameters such as pH, TSS, VSS, COD, NO2-N and NO were measured in order to examine and compare the denitrification rates of each solution. One of the candidate carbon sources achieved specific denitrification rates that were comparable to methanol or acetate, and hence identified for further testing in a full-scale wastewater treatment plant.

Identification of microRNAs that contribute to TRIM32-mediated muscle degeneration

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Thin (tn), a gene found in *Drosophila melanogaster*, encodes for a protein that is homologous to human TRIM32. Mutations in human TRIM32 result in Limb girdle muscular dystrophy 2H (LGMD2H), a progressive muscle disease which limits mobility and decreases the overall quality of life. Mutations in *Drosophila tn* also exhibit progressive muscle degeneration, decreased locomotion, and are pupal lethal. An enhancer/suppressor screen identified two microRNAs (miRNAs), miRNA 11 and miRNA 13b, that when overexpressed, enhanced the fly TRIM32 degenerative muscle phenotype. Bioinformatics analysis was then used to identify messenger RNA (mRNA) targets of miRNA 11 and 13b. To functionally test if these predicted mRNA targets cooperate with TRIM32 to maintain normal muscle structure, candidate RNAi lines for each mRNA were analyzed for enhancement of TRIM32-mediated muscle degeneration. Muscle defects were quantified and compared to the normal TRIM32 phenotype. These results will be presented. Upon determining the mRNA(s) that enhance the TRIM32 phenotype, we will identify where the miRNA(s) bind on the mRNA sequence. Quantitative PCR (qPCR) will then be used to further confirm that mRNA is decreased upon the binding of the miRNA. The identifying of miRNA(s) that enhance the TRIM32 dystrophic muscle phenotype will allow us to better understand additional regulatory elements in muscle tissue that may lead to aberrant muscle pathology in muscular dystrophies such as LGMD2H.

Gender Differences in Play Behaviors, Play Space Use, and Social Interactions During Outdoor Play Activities

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Videotapes of two children, one boy and one girl, from the larger Preschooler's Outdoor Play, Physical Activity Social Skills (POPPAS) project were used to investigate the differences in preschooler's outdoor play activities. Videotapes collected by GoPro cameras were coded to determine children's preferred play spaces and play partners as well as their play behaviors. Specific play behaviors coded included: solitary, parallel, or group play. In addition, cognitive play behaviors were coded. These consisted of the following: occupied, functional, constructive, dramatic, games-with-rules, and exploratory play. Non-play behaviors (i.e., unoccupied, onlooker, transition, peer conversation, etc.) were also identified. Playground spaces were categorized and coded to determine where children play during outdoor play activities. Play areas included: grassy areas, large play structure, garden, adapted swings, planks and ladders, music and art area, etc. Coding was intended to answer the following question '*How do play behaviors, play patterns and play spaces differ for girls and boys during outdoor play?*' It is hypothesized that play behaviors (within play and cognitive behaviors) will exist between boys and girls. It is also hypothesized that types of interactions (adult vs peer) and play space use between boys and girls will exist.

Stand Up Kansas: An intervention to reduce sedentary behavior in the workplace

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The overall purpose of this study is to determine the feasibility and effectiveness of a worksite intervention to reduce sitting time among adults in office-based workplaces. Sedentary behavior is now a recognized health concern as it can lead to cardiovascular issues. The research team will administer a 12-week intervention using several strategies to reduce sedentary behavior at 4-6 Kansas government agencies. Half of the worksites will be randomly assigned to receive the intervention immediately and half will receive the intervention after all follow-up data is collected. To be eligible, worksites must have executive support and 30 or more participants with >75% sedentary time during the workday. Participants must also be able to form a wellness committee and attend two intervention workshops. The intervention will incorporate multiple strategies, including modifications to the policies, programs, and the environment of the workplace. Participating employees will also receive supportive coaching calls and a height-adjustable desk. Research personnel will collect participants' height, weight, body composition, blood pressure, blood lipids and glucose levels, as well as self-reported mood, fatigue, and productivity. Sedentary behavior will be measured objectively using the activPAL4, which will be secured to the thigh of 30 participants at each worksite for 7 days. This device will track minutes spent sitting, standing, and stepping for the duration of the week. All outcomes will be measured at baseline, 12-weeks, and 24-weeks. We expect to see reductions in sedentary behavior and improved levels of the participants' mental and physical health.

The Effects of Differential Rearing on Hedonic Responding in Rats

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While it is evident that isolation increases operant responses for reinforcers such as alcohol, research has not yet determined if isolation decreases or enhances the hedonic value of ethanol as either results in high operant responses. The experiment's purpose is to directly test the effects of differential rearing on hedonic responses using a taste reactivity test on a variety of reinforcers to determine isolation's effects. We hypothesized that differential rearing alters the neuronal structures that are the mechanism for alcohol motivation, so isolated rats would have increased hedonic behaviors and decreased aversive behaviors across a range of ethanol concentrations. In the experiment, randomly assigned male Sprague-Dawley rats were reared in either isolated conditions (IC) or standard conditions (SC) until late adolescence/early adulthood. Each had an implanted intraoral fistula routed to their mouth which delivered 1 ml of solution for one minute as a recording was taken. For a single trial, each rat was given varying ethanol, sucrose or quinine solutions. Taste reactivity data was then scored frame-by-frame to quantify hedonic orofacial responses. The results from the behavioral scoring show trends suggesting that responses between differentially reared rats are similar as a function of ethanol concentration. IC and SC rats did not significantly differ in hedonic and aversive responses as ethanol concentrations increased, suggesting isolated conditions alone may not be enough to change hedonic value. This study can help us further understand the role environmental interventions play in alcohol consumption and help determine whether environmental-induced changes protect against alcohol exposure effects.

Blockade of B2 –GPI decreases hypoxic tissue damage

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Preeclampsia is characterized by high blood pressure in pregnant women. Preeclampsia can lead to premature birth that causes numerous problems in infants. Melanoma is a deadly form of skin cancer that develops in melanocytes, which are skin cells that control pigmentation. Hypoxia is the lack of oxygen reaching the tissues and is present in preeclampsic placenta and melanoma tumors. B2 –glycoprotein I (B2 –GPI) is a protein in high concentration in the blood that binds to hypoxic tissues or damaged endothelial cells. We hypothesized that B2 –GPI plays a role in hypoxic tissue damage and that blocking B2 –GPI may decrease the tissue damage. We investigated melanoma tumors by injecting B16F10 cells into mice and studied them over a span of ten days while injecting peptides on multiple days. Preeclampsia was examined by two methods. First, rats were subjected to placental hypoxia and placenta examined five days later. Second, rat endothelial cells (IEC) were incubated under hypoxic conditions. Melanoma tumors, preeclampsic placenta, and IEC were stained for B2 –GPI binding by immunohistochemistry. We found significant B2 –GPI expression in the melanoma mouse tumors and in preeclampsic placenta. Importantly, peptides that block binding B2-GPI decreased tumor size and also decreased the staining of B2 –GPI in preeclampsic placenta and IEC cells. Using both in vivo and in vitro models, our results concluded that B2 –GPI expression on hypoxic tissues can be blocked using peptides. This blocking suggests possible therapeutics for treating melanoma and preeclampsia.

A Case Study of a Rural, Hispanic Newspaper in the Midwest

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This study examines a Spanish-language publication published in a Midwestern town of a population of about 25,000 and the publication's influence in the Hispanic community. Hispanic media use and consumption at the rural, community level is a topic that has been largely unexplored in the Midwest. This case study will provide insight into the efforts and motives of publishers to expand their coverage to Hispanic audiences, as well as insight into the reception of those efforts by the targeted Hispanic communities. This will be accomplished by analyzing surveys of a sample of the Hispanic community in the Midwestern town and interviews with select religious and business leaders in the community, as well as a discussion with the publisher and editor of the selected newspaper. This study also integrates contextual information about similar towns and cities in the region, including population statistics, media information and select interviews with leaders of media organizations in communities with substantial Hispanic populations.

These surveys and interviews are expected to reveal the most effective methods of communicating with the rural Hispanic audience. Researchers also will look at the goals of the publications and what steps they can take to achieve those goals. We also expect to see how the Hispanic community could be better served in their information needs. The information we discover will be valuable to the publication we are studying, as well as to other publishers in communities with a substantial Hispanic presence.

A viral oxidoreductase modifies viral structural proteins – a requirement for viral infectivity

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Virions have a structural blueprint and an enclosed architecture required to protect the viral genome and transfer infection between cells. Changes in capsid or capsid-associated protein stability and/or conformation occur at specific stages during virus multiplication. Disulfide bonds within virion proteins can provide structural determinants required for virus replication. Baculoviruses are one of only a few types of viruses that encode a conserved sulfhydryl oxidase gene. This viral enzyme is able to oxidize protein thiol groups to disulfide bonds. The formation of disulfide bonds usually occurs in the endoplasmic reticulum, a site with an oxidizing milieu, as proteins are trafficked to the cell membrane. In contrast, oxidation reactions are not favored in the nucleus or cytoplasm of cells, where the environment is reducing. Autographa californica multiple nucleopolyhedrovirus (AcMNPV) encodes a functional sulfhydryl oxidase, Ac92. Deletion of *ac*92 affects both virion types that are produced during virus replication, resulting in non-infectious budded virus and singly, rather than multiply, enveloped occlusion-derived virions. Using an in vitro assay, we found proteins in virions of AcMNPV that contain disulfide bonds. To identify the virion proteins containing disulfide bonds, we utilized an unbiased proteomic assay in which proteins containing thiol-reactive groups were alkylated and differentially separated using two-dimensional gel electrophoresis. Mass spectrometry was subsequently used to identify modified proteins. Continuing these studies will provide insight into the mechanisms of virus assembly and virion stability in the budded and occlusion-derived virions. This information may also translate into methods important to express correctly folded proteins in heterologous systems.

Gender Pay Gap at IPO Firms

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According to a study conducted by Bernadette D. Proctor in 2015, women working full time in the United States typically were paid just 80 percent of what men were paid. This 20 percent pay-gap is observed both at the rank-and-file labor-force and the corporate executive levels at public corporations. However, the state of gender pay-gap at entrepreneurial ventures or IPO firms is not well documented. This research project is aimed at filling this gap in the literature. The research motivation for undertaking this study is twofold. First and foremost, if we were to study the nature of gender pay gap more closely, it is essential that one examines the firms that straddle between small and large, and private and public; IPO firms perfectly fit that description. Second, this topic draws significant interest of the media and is deemed important in policy circles so that any socio-economic gender bias can be eliminated, or at best alleviated, through curative policies. The main hurdle of conducting this research is the lack of readily available data on entrepreneurial firms. But this data can be hand collected from EDGAR's (SEC's Electronic Data Gathering, Analysis, and Retrieval system) IPO prospectus filings. Therefore, we have begun the process of collecting data from EDGAR. Our sample of IPOs is between 1996 and 2013 obtained from the Securities Data Company (SDC). Accounting data would be collected from Compustat. For a comparative analysis with the S&P 1500 companies, we would use Execucomp data. The study would principally rely on regressions and matching methodologies for analysis. We have collected about half of the required data from EDGAR, which does not allow us to state anything definitive at the moment. We are hoping that the data collection will be completed by the end of spring 2018, and a working draft of an academic paper will be ready by the end of summer 2018 for conference presentations and submission to a journal for publication.

Evaluation of an Immunomodulatory Feed Additive during the Transition Period: Immune Cell Counts in Blood

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The transition from a pregnant and non-lactating state to a lactating and non-pregnant state is the most tumultuous period experienced by a dairy cow, in part due to a relative immune suppression at this time. The purpose of this project is to evaluate whether the feed additive Omnigen-AF® (OMN; Phibro Animal Health, Teaneck, NJ) modulates the peripheral immune system during the cows' transition periods. Thirty Holstein cows were used in a randomized complete block design. Cows were blocked by expected calving date and randomly assigned within block to treatments 60 days before their expected calving date. Treatments were OMN (56 g/d top-dressed on ration) or control, and cows remained on their respective treatments through 49 days postpartum. Blood samples were taken on d -60, -30, -14, 1, 7, 14, 28, and 42 relative to calving for analysis of leukocyte, erythrocyte, neutrophil, lymphocyte, monocyte, eosinophil counts, protein and fibrinogen concentrations in a hematology analyzer (ADVIA 2120i, Siemens Healthineers, Erlangen, Germany). Statistical analyses were performed based on the data from the 14 cows that have completed the entire trial, using mixed models with repeated measures over time. OMN did not affect any parameter evaluated during the pre-partum period. On the other hand, OMN increased postpartum blood counts of leukocytes and tended to increase the blood counts of neutrophils, lymphocytes, monocytes, and eosinophils. No effects were detected on blood protein and fibrinogen concentrations. So far, data suggest that OMN can modulate the immune system of early lactating cows.

Delivery of a Peptide with Anti-Cancer Activity Using Mesoporous Silica Nanoparticles

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SA-K_6L_9-AS is a highly cytotoxic oligopeptide, which can potentially destroy cancer cells, yet it cannot be delivered systemically because of its toxicity. A second obstacle is that SA-K_6L_9-AS does not show significant selectivity towards cancer cells. The Bossmann group has developed the use of mesoporous silica nanoparticles (MSN) as containers for the delivery of therapeutic peptides. They are virtually not toxic and are taken up quickly by transport cells such as neural stem cells and leukocytes. Using MSN as a container will "gift-wrap" the peptide sequence and therefore, retain its toxicity. Human cells are able to dissolve the silica, thus releasing the peptide. The advantage of this method is to load anti-cancer peptides into safe transport containers, followed by efficient release once the target has been reached. The advantage of using cells as a transport modality is to target tumors and metastases with high efficiency.

Evaluation of Cell Culture Media Supplemented with pHPL-depleted exosomes on HUC-MSCs and Cancer Cell lines

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Exosomes are micro vesicles that are made in prokaryotic and eukaryotic cells. Exosomes are thought to have many functions such as cell-cell communication, antigen presentation, cell proliferation, and plays a factor in metastasis of cancer cells. Exosomes are also thought to be involved in cancer signaling and metastasis. In this work we evaluate the effect of cell culture media supplemented with pHPL-depleted exomes, on cell viability and proliferation of human umbilical cord mesenchymal stem cells (HUC-MSCs) and cancer cell lines. All these cells are derived from donors, processed, and cultured in our lab. For the experiment we are testing six different cancer cell lines and two different HUC cell lines, each subjected to two different exosome depleted media, treatments. Both treatments are different from each other and the difference between them is not known to avoid biased opinion. Once the cells are ready to be cultured in the treatments, they will be monitored and recorded, having pictures taken, every twelve hours during their development. When the cells become confluent, the viability, cell concentration, and cell proliferation will be taken in a cell counting chamber. After all this information has been recorded the doubling time will be found as the final measurable. These variables will be used to determine whether exosomes have an impact on the cell's development in cell culture. It is expected that the HUC-MSC and cancer cells will not grow as well due to not having the many factors that exosomes have to contribute.

Exploring Individual Differences in Risk Taking with Ambiguous Goals

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This experiment is interested in personality differences in individuals and how these differences predict different levels of risk taking in a fuzzy goal task. One hundred and eight undergraduate students (64 women, 44 men) enrolled in General Psychology at Kansas State University (M_{age} = 19.2 years, SD_{age} = 2.6 years) participated in the online study for partial fulfillment of a research participation requirement. The HEXACO personality inventory was administered at the beginning of the study. Participants then completed 10 trials of a decision under risk task which asked them to choose between two routes to travel to a friend's surprise birthday party. Time was manipulated across the trials in 5-minute increments so, eventually, only the risky route would reach the party in time. To ensure that the ambiguous goal in the decision under risk task did not lead to systematic differences in responding, tolerance for ambiguity was also assessed. The data were analyzed using mixed effects logistic regression. As hypothesized, those who score high in emotionality and conscientiousness predicted less risk-taking, and contrary to the hypothesis, agreeableness was not related to risk-taking. Although two of the personality characteristics were related to risk-taking, the effects were small and may not replicate reliably. Further study is needed to determine the predictive ability of HEXACO personality traits in the domain of decisions under risk and with fuzzy goals.

Quantifying Gait Changes Using Microsoft Kinect and Sample Entropy

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This study describes a method to quantify potential gait changes of human subjects. Microsoft Kinect devices were used to provide and track coordinates of fifteen different joints of a subject over time. Three male subjects walk a 10-foot path multiple times with and without motion-restricting devices. Their walking patterns were recorded via two Kinect devices through frontal and sagittal planes. A modified sample entropy (SE) value was computed to quantify the variability of the time series for each joint. The SE values with and without motion-restricting devices were used to compare the changes in each joint. The preliminary results of the experiments show that the proposed quantification method can detect differences in walking patterns with and without motion-restricting devices. The proposed method has a potential to be applied to track personal progress in physical therapy sessions.

DACA Invisibility/Hypervisibility: Outcomes & Impacts for Dreamers in Kansas

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This study analyzed the effects of DACA (Deferred Action of Childhood Arrivals) on college students. We accomplished this by (1) identifying DACA recipients who are currently enrolled students at KSU, and (2) conducting oral histories in order to document their lived experiences. The oral histories gave an overview of the student's life, as well as their life after qualifying for DACA. Major themes included inter-generational migration, citizenship status, language/multilingualism, race/ethnicity, gender, sexuality, and socio-economic status. While DACA may provide some benefits such as employment opportunities, scholarships, and documentation eligible for travel including ID cards, drivers licenses, and social security, the oral histories revealed that DACA recipients are still confronted with challenges or hardships because of their legal standing. For example, at KSU, DACA recipients hesitate to reveal or comment on DACA due to fear of exposure or xenophobia. However, many find support within specific niches at KSU such as student organizations (e.g. LULAC and HALO) or advisors such as the Academic Services and Diversity Coordinator. As of now, students continue to utilize their current standing with DACA while advocating for a "clean" Dream Act, or a resolution to Trump's recent Executive Order on the removal of DACA.

Intersecting Logic and Energy Transfer through Engineering Design: Shifting Mental Frameworks for Conceptualizing Natural Phenomena

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Illustrative diagrams have been used to reveal and assess depth in conceptual understanding of abstract concepts of phenomena naturally occurring in the physical world. Alternative or naïve conceptions of concepts such as electricity and the flow of current in a simple circuit often persist through secondary level physics if not addressed by eliciting students' ideas and intervening with a conceptual change strategy. This study examines the effects of using Little Bits, color coded electronic building blocks, to help students assimilate or accommodate new conceptual knowledge into their existing schemas, or ideas. We attempt to identify mental pathways students use to master and apply scientific explanations of current, electricity, and energy transfer. Little Bits provides opportunities for students to explore coding, and apply logic gates in simple circuits. Through an engineering design challenge, middle level students in the Kansas City, Kansas, School District, USD 500, are given a challenge to create a functional invention, capable of producing either sound, light, or motion. During a learning cycle lesson, prior knowledge and mental modeling are captured as students create diagrammatic representations of plans to design creative inventions. Following creation and testing of the functional models, students modify their (mental modeling) designs, which illustrates conceptual shifts in reasoning. The diagrams are evaluated using the Staples Rubric of Hierarchical Levels of Reasoning (SRuHLR). An ANOVA test conducted on the mean scores of the diagrammatic representations will determine if there is a significant difference between levels of reasoning based on the intervention of logic gates as mechanisms for understanding energy transfer. The research provides insight into the methods of strengthening students' ability to apply reasoning of natural phenomena to shift from a consumer driven role to inventing new scientific technologies.

Identifying targets of conserved miRNAs that may function in the NUAK kinase signaling pathway

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NUAK is a serine/threonine-protein kinase involved in various processes such as cell adhesion, cell proliferation and tumor progression. The NUAK1-/-; NUAK2-/- double mutant is embryonic lethal in mice making it difficult to study its physiological functions. However, mutation of the single *Drosophila NUAK (dNUAK)* gene is viable through larval stages, allowing for the *in vivo* examination of miRNAs in dNUAK signaling. To take advantage of our genetic system using muscle tissue to identify conserved molecules that function with NUAK, we screened 60 microRNAs (miRNAs) for genetic interactions. Two conserved miRNAs, miR285 and miR8 were identified as *dNUAK* genetic interactors. Based upon our preliminary data, we hypothesize that miR285 and miR8 are regulating mRNAs whose gene products function with *dNUAK* to enhance muscle degeneration in a heterozygous *dNUAK*+/- background. Bioinformatics analysis programs were used to scan for complementary sequences in the 3' UTR regions of mRNAs that may be targeted by miR285 or miR8. We identified 25 mRNAs that were predicted in all three programs (miRanda, Target Scan, and PicTar) and prioritized candidates based upon tissue expression and predicted biological functions. Knockdown of the candidate mRNA should produce a similar phenotype as overexpression of the miRNA, since binding of the miRNA to the 3' UTR causes mRNA degradation or blocks protein translation. A summary of the results will be presented. Future experiments will further investigate how these miR285 and miR8 targets play a crucial role in the NUAK kinase signaling pathway.

Analysis of Inclusion Mechanisms at Kansas Board of Regents Institutions

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Around Kansas, students of diverse backgrounds struggle to be heard at the state level amidst ongoing, disproportionate adversity. Faculty, staff, and students from the Kansas Board of Regents (KBOR) universities represent their respective institutions as committee and council members within the KBOR structure, but there is not a body tasked solely with advocating for our state's growing populations of traditionally underrepresented and marginalized campus communities. Universities continue to face issues regarding diversity and inclusion. The Students' Advisory Committee (SAC) is made up of the student body president from each of the seven KBOR universities. This year, the SAC created the Task force on Diversity and Inclusion to serve these largely unheard voices. The Task force conducted inquiries into the state of inclusion-related mechanisms and outcomes at each university by visiting campuses and meeting with appropriate faculty, staff, students, and community members. Specifically, these findings are translated into a series of reports that, for each university, provide insight into general demographic information and campus climate as well as the role of their respective student government, administration, and community partners. These reports will be presented to the Regents by the chair of the SAC, and will help highlight best practices of diversity and inclusion across Kansas. The findings from this research will serve as justification for the Task force's proposal to create a Council of Chief Diversity Officers within KBOR, and serve as groundwork for diversity and inclusion efforts to come.

Gender Bias in the Media

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Within our society, gender diversity throughout the workforce has become a concern for many. While some fields have fully accepted a diverse workspace, others have yet to make the transition. The focus of study for this research is on the gender divide within television news. The research focuses on the balance of news content delivery between males and females. Preliminary data indicates that males typically have more air time covering hard news such as politics, crime, and international affairs whereas women are noticeably presenting more soft news stories that target human interest, features, and education. The research will compare and analyze live streamed newscasts from the second week of October 2017, from large market areas, limited to Dallas, Texas and Seattle, Washington. Each newscast will be coded for market size, station affiliate, anchor gender, reporter gender, story topic and gender of expert/non-expert sources. When the coding has been finalized, the data will be able to show whether gender bias remains relevant and if a particular gender of news talent is more prominently represented in the television news industry. Research is currently in progress; however, it is possible that the gender bias identified in research from the prior year will remain a prominent concern. The results from this research are crucial because if gender bias is shown in this research it may have social influences regarding gender segregation in the news. Although this research is primarily focused on gender representation and segregation in news broadcasts between two different designated market areas, data may show that the bias is much more than a media issue. This research will be presented as a case study of gender representation in news media and able to show if males and females are being given the same opportunities and privileges as their opposite sex colleagues.

Recombinant expression of outer membrane proteins of *Ehrlichia ruminantium* and their assessment as potential diagnostic and vaccine antigens

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Heartwater disease is a tick-borne disease of domestic and wild ruminants which is endemic in the Caribbean and sub-Saharan Africa. This disease is caused by the intracellular pathogen *Ehrlichia ruminantium* and affects cattle, sheep, and goats. It is currently not present in the United States, but there are three North American species of *Amblyomma* ticks that can experimentally transmit Heartwater indicating substantial risk of introduction in North America with devastating consequences to the domestic livestock industry. The objective of this project is to express *E. ruminantium* outer membrane proteins and assess their use as potential antigenic targets for serodiagnostic and vaccine development. The outer membrane proteins selected were: major antigenic protein 1 (MAP1) of Kerr Seringe isolate, and the rickettsial type IV and VI secretion systems. Using a eukaryotic recombinant baculovirus expression system the genes were cloned and proteins expressed in Sf9 insect cells. The recombinant proteins were purified by affinity chromatography using nickel columns, and specific immunoreactivity assessed using anti-*E. ruminantium* polyclonal serum by western blot analysis and indirect enzyme-linked immunosorbent assay (ELISA). All the outer membrane proteins were successfully expressed as demonstrated by anti-His (C-terminal)-HRP monoclonal antibody detection. Furthermore, the recombinant proteins were recognized by polyclonal *E. ruminantium* antiserum from a sheep experimentally infected with a heartwater isolate. Manifestation of specific immunoreactivity with the *E. ruminantium* antiserum suggests the ability of the outer membrane proteins to induce host-specific immune responses and thus potentially serve as serodiagnostic and vaccine targets to control heartwater in susceptible livestock.

Understanding the Complexity of Jealousy: Negative Attribution, Relational Commitment, and Relationship Problems

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Jealousy, a complex emotion encompassing feelings ranging from fear to rage, has been found to be among the top three most frequently experienced issues in romantic relationships. Although there has been research done on how different types of jealousy affect relationship satisfaction, the underlying mechanisms for how jealousy affects areas of a romantic relationship are not well-understood. The present study used data from the International Dating Violence Study to understand the role jealousy plays in negative attribution of romantic partners, how the view of their partner relates to commitment, and altogether, what role it plays in relationship problems in Latin American and American emerging adults. Understanding the complexity of jealousy can enhance what is known regarding how jealousy contributes to relationship problems. This understanding can in turn be used to help couples manage effects of jealousy in ways that are more productive for the stability and quality of relationships.

Culturally Appropriate Inspiration of Fashion: Focus on Guatemala

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The purpose of this project is to explore ways in which apparel and textile designers can be inspired by cultures other than their own without the use of cultural appropriation. By demonstrating how a designer can create original apparel and textile designs utilizing Guatemalan culture as a main source of inspiration while avoiding cultural appropriation, this project strives to communicate ways in which designers can respectfully and appropriately utilize cultures other than their own original work. Using a step-by-step creative design process, this research explains the methods and precautions taken to be appropriately inspired by Guatemala and avoid appropriating Mayan culture while, in result, creating an original apparel fashion line. This project researches the history, methods, and meaning of Guatemalan dress and textiles to develop a deep understanding for the cultural significance of Mayan dress. The study also includes participation in a faculty-led study tour to Guatemala to gain further knowledge and understanding of Guatemalan culture, learn traditional methods of producing Mayan textiles and dress, and to collect sources of inspiration for the project. Upon completion of this project, a concept board including direct sources of inspiration for the apparel line from Guatemala, textile print designs, technical flats, and fashion illustrations are presented along with a literary review explaining how the designer was inspired and utilized aspects of Guatemala in a manner that is respectful and appropriate.

The Salt Survival and Azo Dye Degradation of Saltcedars

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Flue gas desulfurization water is purposefully discharged into wells or bodies of water near coal-fired power plants. It contains compounds like sodium chloride, sulfate, and boron in large amounts that can kill plants. Boron in small amounts can severely hinder growth or kill many normal plants, so this is very dangerous to plants in our environment. In our lab, we are looking to replicate the flue gas desulfurization water in order to see how it is taken up and secreted by saltcedars. These plants are known for invading many dry, hot areas of the world as an invasive species. We grew the saltcedars hydroponically in solutions containing different amounts of salts and boron with nutrients. Over time, the plants were weighed to see how much water they are using per day to measure how much they grew. So far, we have learned that the saltcedars can tolerate high amounts of sodium chloride, sodium sulfate, calcium chloride, and boron. This makes them suitable for planting near Flue gas desulfurization water affected areas in hopes of stopping future contamination from spreading or even eliminating it from the environment. We think that their ability to take up salt from the environment and secrete it onto their leaves could be part of the reason why they can survive such high amounts of boron. However, we do not know how they uptake or secrete these molecules. We plan to use inductively coupled plasma-atomic emission spectroscopy (ICP-AES) to evaluate what elements and in what amounts are secreted from their leaves. This research can potentially create an ecofriendly solution to pollution in the environment.

IPOs, Executive Compensation, and Firm Performance

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Most businesses in the United States have had the chance to become public through initial public offerings, or IPOs. IPOs allow for some of the stock of a private company to be sold to the public. These IPOs generally bring in more capital to a business so the question of whether there is a specific determinant in executive compensation between males and females during these IPOs and if this has an impact on firm performance arises. The purpose of this research is to find if gender inequality pay exists in executive compensation during IPOs and if there is an impact on the performance of a firm. The age, gender, and ethnicities of over 1,240 executives of about 230 firms was hand collected mainly from EDGAR's (SEC's Electronic Data Gathering, Analysis, and Retrieval system) IPO prospectus filings. The sample of IPO's is from 2005 and 2010. With the data collected, the comparison of male and female executives' earnings is analyzed, and the performance of the businesses is seen through stock prices and failure or success of the company. The expected results show that women executives make significantly less than their male counterparts when compared with similar executive positions. If the expected occurs, we can conclude that factors such as gender serve as a determinant that can affect executive compensation and firm performance overall.

Copper Binding of Heterocyclic Compounds Is Vital For Novel Drugs Against Resistant Bacteria

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Multidrug resistant bacteria have the capability to be resistant to a majority of available drugs. Thus, finding novel drug candidates is vital. Adults contain 50-80 mg of copper within their body, which resides mostly in the muscle and liver. When bacteria infect the body, copper will emerge at the infected site to fight the bacteria. However, some multidrug resistant bacteria have efflux pumps which recognize copper and force the copper away from their cells. The research we are conducting is aimed toward synthesizing heterocyclic compounds that are able to bind with copper and prevent the copper from being detected by the efflux pumps of the multidrug resistant bacteria. Therefore, copper can go unnoticed by the efflux pumps and fight the bacteria. The compound should be able to not only allow copper to bind to its site, but also allow the copper to detach and fight the bacteria. To synthesize these heterocyclic compounds we have used substitution of pyrazoles and aryl substituted phenyl isothiocyanate compounds. We conducted column chromatography and recrystallization to obtain the purified products. The purified products have been structurally verified by using Nuclear magnetic resonance spectroscopy, ^{1}H-NMR and ^{13}C-NMR.

Polymeric Nanocarrier Synthesis for Drug Delivery Therapeutic Use

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The potential for gene delivery to be used as a treatment for malignant cancer cells serves as the beginning of advanced personalized healthcare. With an estimated number of new cancer cases this past year, we are looking at 1,688,780 people who have been diagnosed, from which 600,920 of these resulted in deaths (National Institutes of Health). Current methods for cancer drug delivery are costly, not stable enough, or cannot deliver the medication to the site efficiently. This present study examines biodegradable, non-toxic therapeutic drug nanocarriers and their effectiveness at being coupled with a linker and peptides for further delivery improvement. A base model polymer was formulated with 1,4-butanediol diacrylate and 3-amino-1propanol, which was then altered by modifying the ratio of reactants. Characterization of the polymer is tested using Nuclear Magnetic Resonance, Dynamic Light Scattering, and Zeta-Potential. On average, the size was determined to be around 700 nm with a positive external charge (4.3 mV). This method offers insight into more effective nonviral cancer treatments with the potential for widespread delivery of therapeutics.

Construction of a Gaussia Luciferase-based STAT3 Reporter

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The Signal Transducer and Activator of Transcription 3 (STAT3) mediates the expression of a variety of genes in response to different stimuli. This makes STAT3 signaling a key pathway in many cellular processes including cell growth and apoptosis. When STAT3 is activated it is phosphorylated and binds to the STAT3 responding element, which stimulates the transcription of downstream genes. In this study, the aim is to construct a STAT3-Gaussia Luciferase reporter plasmid. Gaussia luciferase is a secretory enzyme and its activity can be tested in culture media by providing a substrate. The STAT3 responding elements and a TK promoter with Kozak were synthesized along with the Gaussia luciferase gene by Polymerase Chain Reaction (PCR)-which amplified DNA fragments and were cloned into a TOPO Blunt Cloning vector. Plasmid with the correct DNA sequence was verified by sequencing. The DNA plasmid, which contained the desired fragment, was extracted and transfected into HeLa cells. The Gaussia Luciferase activities were tested from the culture media using a GloMax luminometer upon various stimuli. The higher luciferase activities detected upon stimulation demonstrated the utility of this novel reporter system in STAT3 signaling. This reporter system may be used as a method to test STAT3 activity in immune responses to disease as well as STAT3 activity in cancer.

The Role of Dopamine during Zebrafish Odor-Cued Behavior

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Zebrafish is becoming an increasingly important model to dissect neural circuits of behavior in vertebrates including humans. Our lab uses zebrafish to examine how odor stimuli affect emotional states and motivated (goal-directed) behaviors to develop zebrafish models of human affective disorders and addiction. Dopamine has been shown to be a critical modulator of motivational states in mammals including humans. Currently, it is unclear how the zebrafish dopaminergic systems relate to those described in mammals. Previous work from the lab suggests that the zebrafish dopaminergic bed nucleus of the stria terminalis (BST) connects with two main olfactory cortices. We therefore postulate that the dopaminergic BST nuclei play a role in odor-cued associative learning and motivation. To test this hypothesis, we are employing behavioral experiments that use specific odors such as sex pheromones and predator odors to induce emotional response behaviors. We are using immunohistological detection of phophorylated (p) ERK to study neural activity patterns on postmortem cross sections of the brain. The results of this study will help to understand the role of dopamine in odor-cued emotional response behaviors in vertebrates.

Lighting for Health

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Light plays a major role in our everyday lives. It affects the way we function, work, and sleep. In this research study the focus is how can we model the right type of lighting system and show compliance with the Well Building Standard. Light is absorbed through three different photoreceptors such as Rods, Cones, and intrinsically photosensitive Retinal Ganglion Cells (ipRGCs). Each of these photoreceptors absorb light and send it as information in the form of electrochemical signals to different parts of the brain. The ipRGC's are the most critical out of all three due to the cells being connected to the circadian rhythm which send signals to various parts of the brain that trigger reactions downstream in the body. To quantify the light present in a particular space, a lighting modeling program called AGI32 was used to show the calculations of the Photopic lux levels in a room. Photopic lux or normal lux is a measure of how much light is present at the eye. In this study a set of specifications from a company called the International Well Building Institute, were used and followed to maintain the Equivalent Melanopic Lux (EML). EML is the measure of how the ipRGCs absorb light, which is interconnected with the brain and circadian rhythm. To find EML, Photopic lux is multiplied times the ratio given in the Well Building Standard specifications. Well Building Standards state that for any room without daylight, the EML must be 150 or higher at the eye to stimulate and maintain the circadian rhythm for the duration of the person in that room. In the Well Building Standard specification, it shows how for each CCT rating there is a different ratio multiplier. In this study, two different CCT ratings were used. The first is 3500K CCT with a 0.605 ratio multiplier. The second is 4000K CCT with a 0.76 ratio multiplier. In conclusion the results show that the minimum Lumen output for the luminaires chosen must be 4000 or greater to meet the Well Building Standard of a 150+ Equivalent Melanopic Lux at a vertical four-foot plane. With an EML of 150+, the Circadian Rhythm will be stimulated and will make any person feel a wakefulness when exposed to the light in the room model.

Investigation of two genes *Mast Kinase/Drop* out and *Alpha-catenin*, Involved in Efficient Border Cell Migration in the *Drosophila* ovary

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Collective cell migration is the process by which clusters of cells coordinate and move together to achieve multicellular events such as embryonic development, wound healing, and tumor metastasis. A type of collective cell migration, border cell migration, is found in the developing egg chamber of *Drosophila melanogaster.* During ovarian development, six to ten epithelial follicle cells convert into border cells and travel to the oocyte. Although several genes have been identified to play a key role in border cell migration, of particular interest are the genes *Drop Out (dop)* and *Alpha-catenin*. DOP encodes for a microtubule-associated serine-threonine (MAST) kinase –a protein required for microtubule regulation in humans and cellularization of the early *Drosophila* embryo. Alpha-catenin codes for a protein that links cadherins—a cell adhesion molecule—to the cytoskeleton. During normal border cell migration, clusters of cells move by extending protrusions that contract and signal cell-cell adhesions to pull the rest of the cells forward. However, when DOP and Alpha-catenin are inactivated, the border cell cluster experiences migration defects. We hypothesize that DOP is involved in protrusion formation and that Alpha-catenin plays a role in connecting cells within the collective cluster. To test this, we used a combination of immunofluorescent staining, RNA interference (RNAi), and microscope imaging. Using these techniques, we can further elucidate the role of DOP and Alpha-catenin in border cells and apply this knowledge to understanding the mechanisms and genetic elements behind collective cell migration in both human development and cancer growth.

Electrochemical Growth of a Metal-Organic Framework Material Inside Nanoporous Membranes

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Metal-Organic Framework (MOF) materials are supramolecular structures that are formed from a reaction between a ligand with multiple binding sites and a compatible metal. The metal ions bind to the molecule, creating a 3D grid-like structure that is uniform and porous. MOFs have several potential uses, such as catalysis, detection, and gas storage. Limiting the size of the frameworks to the nanoscale range will help increase volume efficiency by reducing the amount of unusable volume. The objective of this research is to successfully grow nanocrystals of a Cu-based MOF, HKUST-1, inside of aluminum oxide porous membranes that have 100 and 20 nanometer-wide pores. We predicted that as pore density increased with the 20 nanometer membranes we would see an increase of growth inside the membranes when compared to the 100 nanometer membranes. Experimentation was done with electrochemical oxidation of copper metal to form Cu2+ in the presence of trimesic acid, to form a MOF. Cyclic voltammetry (CV) experiments determined the appropriate voltage range, and chronoamperometry (CA) at those voltages resulted in a light-blue substance on the membrane. An optical microscope indicated that growth of the light-blue material was on the external surface of the membrane, rather than inside the pores. A result of increasing pore density per surface area showed an increased amount of MOF that grew inside the aluminum oxide pores. After increasing the CV cycles considerably, more overall growth was seen on the membrane. Once the results are analyzed and the MOF growth is controlled, then this method of MOF growth will be applied to more widely used MOFs. Continuation of these experiments would also include modification of polyester membranes to encourage growth inside of the membranes during experiments.

Funder Acknowledgement: Kansas State University
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Effects of Sugar-Sweetened Beverages on Metabolic Syndrome Risk Factors

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Reducing sugar-sweetened beverage (SSB) consumption is associated with improved metabolic health in adults, but there is limited experimental research examining the consequences of adding SSBs to the diet. Therefore, the aim of the current study was to determine the acute metabolic effects of adding SSBs, in the form of caffeine-free soda and 100% fruit juice, to the diet. College-aged participants (18-30 years; n=36) were randomized to one of three beverage conditions: water (W), caffeine-free soda (S), or 100% fruit juice (FJ), and completed metabolic assessments (fasting glucose, triglycerides, and high-density lipoprotein; 2-hour glucose tolerance, waist circumference, and blood pressure). Participants consumed two servings (~710mL) of their assigned beverage each day for three weeks. All baseline assessments were repeated following the 3-week intervention. Preliminary results (n=34) indicate that 19 participants had at least one metabolic risk factor at baseline. There were no significant effects of time or beverage condition for glucose tolerance (incremental area-under-the-curve) (M±SD; Baseline: W:3072±1402, S:3478±1720, FJ:3258±1504 mg/dL x 2hr; 3-weeks: W:2854±1384, S:3704±1531, FJ:2713±1255mg/dL x 2hr; ps>0.05). There were also no significant differences between beverage conditions for changes in metabolic syndrome risk factors: waist circumference (W:0.40±3.06%, S:-1.46±2.40%, FJ:1.57±3.02%; p=0.06), triglycerides (W:4.077±20.11%, S:38.03±62.50%, FJ:39.64±60.08%; p=0.17), HDL (W:2.05±15.12%, S:5.71±12.25%, FJ:-4.24±16.93%; p=0.32), blood pressure (Systolic: W:-2.31±4.35%, S:-1.40±6.31%, FJ:-1.61±7.01; p=0.92; Diastolic: W:3.11±5.80%, S:0.42±14.51%, FJ:-1.87±10.88%; p=0.53), and fasting glucose (W:4.70±7.57%, S:6.09±9.89%, FJ:4.93±5.32%; p=0.90). Preliminary results suggest that the addition of SSBs, as caffeine-free soda or 100% fruit juice, to the diet for three weeks, does not modify metabolic health. Upon completion of this study (n=36), no significant differences in changes in metabolic risk factors between conditions are expected. These results will help to elucidate the acute metabolic health outcomes associated with adding SSBs to the diet.

An Examination of Supplement Use in Volunteer Firefighters

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Firefighter personnel are trained to respond to emergencies and are essential to community safety. Though dietary supplementation use can improve overall health and performance, limited information exists on supplement use among firefighters. Understanding supplement use may aid in health and physical performance. The purpose of this study is to explore the use and reasons for supplement use in volunteer firefighters. A national sample of 363 volunteer firefighters (aged 18-77, 38.1 ± 12.5 years, 79.3% male, 95% Caucasian) in a wellness program were surveyed on their frequency and reasons for supplement use over the past six months. Questions were asked about supplements such as multivitamins/minerals, individual vitamins (e.g. Vitamin C, Vitamin D), individual minerals (calcium, iron), performance enhancers (glutamine, CoQ10), sports bars/gels, and energy drinks. Stata version 15 was used for data analysis. Of those reporting supplement use, 78 (21.5%) reported using only one supplement, while 277 (76.3%) reported using multiple supplements. Multivitamin/mineral supplements were consumed by 132 firefighters (36.4%) at least twice a week; reasons for consumption included to improve overall health, prevent health problems, and improve cholesterol and blood pressure. Performance enhancers were used by 31 participants (8.5%) at least twice a week; reasons for consumption included increased physical performance, improved overall health, and prevention of health problems. Sports bars/gels were used by 86 firefighters (23.7%) at least twice a week; reasons for consumption included increased physical performance, improved overall health, and weight loss. Energy drinks were consumed by 124 firefighters (34.2%) at least twice a week; reasons for consumption included increased physical performance, cognitive function, and relaxation/stress management/mental health. Overall, most firefighters who reported supplement use did so for improvements in overall health and to prevent health problems. Interestingly, firefighters in this study reported higher overall supplement usage than other tactical athlete populations (i.e, military personnel: 55-61%). Future investigations should examine the resulting impacts of supplement use on health and occupational performance in firefighters.

Dark Halos: The Power Spectrum's Dependence on Mass

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Today, it is believed that approximately 80 percent of the matter that comprises the universe takes the form of dark matter--a theorized substance that interacts with "normal" baryonic matter mostly through gravitational force. Through gravitation, dark matter creates potential wells that determine the motion of stars inside galaxies and galaxies inside galaxy clusters. Dark matter accumulates and forms roughly spherical structures called "dark halos". Most galaxies and groups of galaxies are located inside such halos. Visible matter tends to cluster inside these halos because of the higher accumulation of dark matter and deeper gravitational wells. The power spectrum is obtained from a Fourier transform of the "galaxy correlation function" which is simply the degree of clustering over a certain scale. The power spectrum is useful for analysis of clustering and density fluctuations as it gives the variation power as a function of the spatial scale--thereby enumerating the magnitude of small fluctuations in density that through gravity, are amplified and give rise to large-scale universal structure. The purpose of this project is to calculate and determine how the power spectrum of halos depends on their mass using the data from the DarkSky Simulations Collaboration. The goal is to observe how the statistical properties of halos of different masses are related to the properties of their progenitor dark matter.

Correlates of Overweight and Obesity in Special Olympics Athletes

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Adults with intellectual disability have poorer physical activity, dietary intake behaviors, and higher rates of obesity, as compared to the general population. The aims of this serial cross-sectional study were to: 1) determine whether there were associations between physical activity and dietary intake with body mass index (BMI) among adults in Special Olympics; and 2) investigate trends in physical activity and dietary intake within this population over a 10-year period. We obtained data on international Special Olympics participants (N=41,366, 36.9% female) from 2007 to 2017. Data collection for each participant took place as part of the Health Promotion "discipline" that included a health-related evaluation performed by a medical team. Physical activity and dietary intake were recorded along with demographic and anthropometric information including age, sex, height, weight. The average BMI for our sample was 27.0±7.1kg/m2. Participants in the highest tertile of physical activity had lower odds of overweight/obesity (OR=0.81, 95%CI=0.77–0.84), as compared to the lowest tertile. Those in the highest quartile of sugar-sweetened beverage (SSB) intake had higher likelihood for overweight/obesity (OR=1.26, 95%CI=1.19–1.33), as compared to those who never consumed SSBs. Participants with the highest intake of fruits and vegetables had greater odds of overweight/obesity (OR=1.47, 95%CI=1.23–1.75) as compared to those never consuming fruits and vegetables. From 2007-2010, there was a weak, but significant association between BMI and year (r=0.008, p=0.028), Fruit and vegetable consumption (r=-0.499, p<0.001) and calcium consumption (r=-0.483, p<0.001) were significantly associated with year of data collection. Results suggest that among adult Special Olympics participants, daily physical activity is a protective factor, whereas daily consumption of SSBs and more than five servings of fruits and vegetables are risk factors for overweight/obesity. Additionally, consumption of fruits and vegetables and calcium has decreased over time, with no clinically significant changes in BMI.

Detection of anti-staphylococcal activity by utilizing copper-dependent inhibitors with an extended thiourea group

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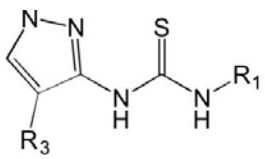
Multi-drug resistant bacteria are proving to be a major problem for the health care system. Current drug discovery screenings have failed to produce proper antibiotics for methicillin-resistant *Staphylococcus aureus* strains (MRSA). Copper has been proven to activate antibacterial properties of copper-dependent drugs that inhibit the growth of MRSA. We have developed a new drug discovery screening method that utilizes the properties of copper in order to distinguish anti-staphylococcus copper-dependent compounds. The screening of 10,000 compounds for anti-staphylococcal activity in copper revealed 53 of 129 active compounds exhibiting copper-dependency. The findings of an extended thiourea group called NNSN motif on copper-dependent compounds, resulted in copper-dependent and copper-specific inhibition of *S. aureus*. These compounds have been found to display effective anti-MRSA activity. Therefore, by developing a copper-based screening, we have discovered that copper-dependent compounds that contain NNSN, can be used to inhibit the growth of MRSA. The second step of this endeavor consists of the synthesis of multiple compounds with an extended NNSN motif. This research is guided by the paradigm that by systematically varying the substituents R1, R2, and R3, which have been identified as essential, an optimal drug candidate can be found. The activity measurements are being performed by Dr. Wolschendorf and his team at UAB.



Compound with NNSN motif. In phase 1 of this synthetic effort, substituents in positions R1, R2, and R3 will be systematically varied.

Gymnemic Acids Negatively Affect Cavity Causing Microbial biofilms

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Dental caries (cavities) are one of the most prevalent diseases in humans around the globe. Many microorganisms found in our mouths produce acidic biofilms, which burn through the enamel of our teeth. Further, mixed biofilms of different microbes in the mouth enhance the severity of oral diseases. In this study, we looked at two common oral microorganisms that have demonstrated a synergistic relationship in previous research. We hypothesized that Gymnemic Acids (GAs), an herbal extract, will reduce the total amount of biofilms produced by both *Streptococcus gordonii* and *Candida albicans*. We grew various combinations of these two microbes in twenty-four well plates separately and together in 1% sucrose Yeast-Tryptone broth at 37 degrees Celsius in a 5% CO2 atmosphere for 24 hours. Here we measured the turbidity of the broth, the amount of the attached biofilms through crystal violet staining, and the extracellular DNA produced by the biofilms with a spectrophotometer. Additionally, we tested the GAs effect on these biofilms in 10% saliva coated wells to replicate a more natural environment. When exposed to GAs we found a decreased amount of biofilms produced by *S. gordonii* and a morphology change in *Candida albicans*. Soon we will begin to use denture material (Hydroxyapatite disks) and eventually move into an in vivo experimentation. Further research will also be conducted to understand why and how these effects are occurring.

Efficacy of different iron fortificants on improving iron outcomes in those with inadequate iron status; a systematic review

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Background: Iron-deficiency anemia is one of the biggest health problems which impacts the global population, affecting approximately two billion people, about 30% of the world population. This condition leads to a lack of healthy red blood cells, which can cause many complications. There is a belief that certain forms of iron are more efficacious in combating iron-deficiency anemia; however, no one has systematically reviewed the literature to determine whether there is evidence to support this belief.
Aim: To determine the relative efficacy of different iron fortificants on iron outcomes in populations with inadequate iron status.
Methods: A literature search was conducted using Web of Science, PubMed, ProQuest, Scopus, Agricola, and Cochrane databases during January - February 2018. Search terms were used to identify articles describing human iron supplementation or fortification studies that contained data on desired iron status outcomes. This search identified 135 manuscripts. Manuscripts were then excluded based on the following criteria: not human subjects (animals, plants, *in vitro*), reviews/secondary analyses, abstracts, book chapters, theses, survey studies with no intervention, and those lacking iron-status outcomes.
Results: After manual abstract review of the remaining 135 articles, a total of 18 were deemed relevant to the study after following the exclusion criteria.
Conclusion: The final step is to compare iron status outcomes changes between the different iron fortificants hopefully using meta-analysis.
Keywords: Iron deficiency anemia, iron fortification, hemoglobin, ferritin iron status and humans

Studies Towards the Development of a Universal Transport Method for Gram-Negative Bacteria

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Gram-negative bacteria are composed of an outer membrane that is covered with a lipopolysaccharide layer. This layer makes it difficult for small molecules to cross the membrane via standard passive diffusion. As such, compound transport across this barrier is via porin channels. These channels are highly restrictive and thereby require specific physicochemical properties to be present within any small molecules utilizing them. Upon entering the cell, small molecules are susceptible to efflux pumps, which pump them back to the exterior of the bacteria. Therefore, small molecules are prevented from accumulating to physiology levels required for their cytotoxicity. The critical problem is that small molecules need to traverse porins faster than they are pumped out, which is currently not the case. Antibiotics for gram-negative bacteria face this same difficulty in penetrating into the core of the bacteria, and therefore, bacteria can become resistant to these drugs rapidly due to the inability to kill the swarm in its entirety. It is the inability to transport compounds into gram-negative bacteria, the ability of the bacteria to become resistant, and the fact that all of the big pharmaceutical industries have pulled resources from gram-negative bacteria research that a world health epidemic is on the horizon. The objective of this project is to investigate how physicochemical properties within small molecules affect penetration of gram-negative bacteria. To accomplish this, we aim at synthesizing a collection of molecules that have unique physicochemical properties to investigate how and which said properties can be used to penetrate gram-negative bacteria. For this, we plan on using some of the complex intermediates within our current total synthesis route towards the brocazine family of natural products in this charge. We envisioned the construction of universal penetrating small molecules (chaperones), with imparted properties discovered through this work, to allow rapid transport into gram-negative bacteria. These chaperones can then be attached to known antibiotics, which currently have limited or no penetration, for new therapies in the treatment of gram-negative infections. This project is still ongoing.

Changes in Financial Knowledge, Attitudes, and Behaviors Post Financial Counseling

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The purpose of this study was to test the effectiveness of peer-based financial counseling. To do so, we examined mean differences in financial knowledge, attitude, and behavior scores starting with an initial intake questionnaire followed up with a survey two months later. Results suggest that financial counseling had positive effects on the students' knowledge of insurance and feeling more comfortable about one's financial situation. Reductions in financial anxiety, better borrowing, spending, and long-term planning behaviors were also observed. However, financial counseling did not show to improve knowledge of credit and retirement needs. Within sub-groups, females and undergraduate (versus graduate) students tend to gain more perceived knowledge from counseling. First generation students made less improvements in retirement knowledge but greater improvements in short-term planning behaviors compared to non-first generation students.

Improving Sleep Quality for Children with Autism Spectrum Disorder

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Recent studies have indicated that children with Autism Spectrum Disorder (ASD) have difficulty sleeping and that sleep quality can affect their ability to learn during the day. Less is known about the more severely disabled portion of this population, many of whom are nonverbal and must deal with multiple types of challenges. The purpose of this project is to develop and test a sensor bed that can track the sleeping patterns of children with severe disabilities who reside at Heartspring in Wichita, KS. Heartspring is an educational and residential facility that offers a wide range of services and therapies for children with special needs. The bed design incorporates a collection of sensing elements that will allow the determination of child nighttime well-being. Sensor data acquisition is managed with a LabVIEW version 14.0.1 virtual instrument that acquires data from four electromechanical films and six load cells via an NI 9205 module. The KSU team plans to collect data from students at Kansas State University to validate the bed operation. These students will use a test bed that is set up at Lafene Health Center. This bed is configured in a manner similar to the bed to be used with disabled children, but it is supplemented with electrocardiographic sensors used with more traditional sleep study environments.

White individuals' perceptions of reappropriated versus non-reappropriated Black racial slurs used by Black individuals toward White individuals

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Recent research on slur reappropriation suggests that groups may adopt the use of slurs, that were once used to target their group, to use among themselves as a means of affiliation and group bonding rather than derogation. Applying theories of intergroup relations to this phenomenon, O'Dea and Saucier (submitted) examined White individuals' perceptions of "nigga" when used by a Black individual toward a White individual, generally showing White individuals to perceive this usage as affiliative. Extending this research, we examined the relationships between participants' levels of racial prejudice and their perceptions of racial slurs used by Black individuals toward White individuals, and we examined whether these relationships depended on whether the slur used was a reappropriated term (e.g., "nigga") or not (e.g., "porch monkey"). Building on previous research, we predicted that White individuals higher in racial prejudice would perceive the reappropriated slur as more threatening than the non-reappropriated racial slur, and subsequently perceive that racial prejudice toward Black individuals is more justified after seeing the reappropriated slur than after seeing the non-reappropriated slur. The findings from this study were consistent with these hypotheses. Specifically, higher levels of racial prejudice were related to higher levels of threat and perceived justification of prejudice toward Black individuals for both slurs, but the effects were stronger for the reappropriated slur. Taken together, these findings indicate that, even though reappropriated racial slurs may be used with positive intentions (contrary to the negative intentions surrounding non-reappropriated slurs), their usage may polarize the anti-affiliative attitudes of White individuals higher in racial prejudice.

Emotion Estimation Through Brain-Computer Interface

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Brain-computer interface (BCI) has become a powerful tool used to bring a new understanding of the neuroscience behind communication. Our research moves this work forward by focusing on emotion estimation to account for the influence of emotions in this field. Research groups have claimed to detect emotion in other studies, but our focus is to ensure that which is detected is not a task-specific response but instead a true emotion. We have approached this by conducting a study that presents two different stimuli systems, the International Affective Picture System (IAPS) and the International Affective Digital System (IADS). We measured and recorded brain activity, and incorporated a self-assessment survey. After pilot testing, we increased the number of images the participants were exposed to. Still, we found poor classification rates. We were able to classify pictures as causing a high or low level of excitement with an average of 65% accuracy, while the accuracy of pleasant or unpleasant was only 55%. Furthermore, while 65% appears to be above chance, participants displayed strong bias in their responses on the surveys – as a result, our results are inconclusive. Data collection is ongoing, and we are working to find the affecting factor and results that will lead us to see if transfer learning can apply. Ultimately, we hope to develop a greater understanding of emotions in efforts to increase behavioral control.

Effects of Folic Acid Supplementation on Critical Speed

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Recent research has suggested that folic acid supplementation in female athletes with amenorrhea helps increase flow mediated dilation in the brachial artery. Due to the low estrogen levels found in irregular menstrual periods, endothelial dysfunction is more common. The purpose of this study is to determine if endothelial dysfunction is associated with impaired exercise performance. Female distance runners (n=20-40) between the ages of 18-40 will complete both a placebo and 10 mg/d of folic acid supplementation trials on randomized days. Participants will perform multiple assessments such as post-occlusive reactive hyperemia (PORH) test, maximal voluntary contraction with a handgrip ergometer, constant power hand grip exercise, and three minute all-out sprint test. The three minute all-out sprint test will provide the critical speed, or the highest speed that the female runner could maintain without stopping. All assessments will be obtained 2 hours post consumption of the placebo or the folic acid supplementation. We hypothesize that the increase in endothelial function (PORH) from the folic acid supplementation will increase the time to exhaustion during the constant power handgrip test and the critical speed of the female runners. These findings would provide evidence that female runners who experience endothelial dysfunction from training could mitigate this dysfunction with folic acid supplementation.

The Hungarian Algorithm: A Matchmaking Algorithm for Maximum Matchings in a Bipartite Graph

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The Hungarian Algorithm is a combinatorial optimization technique for solving assignment tasks. This is a special type of linear programming problem which deals with the allocation of various resources to various activities on a one to one basis. The algorithm computes in a manner that minimizes the cost or time involved in the process and profit or sale is maximized. Matching problems can be thought of as network flow problems and they have implementations in different disciplines. The objective of this research is to obtain a deeper understanding of the algorithm to utilize its capabilities in the algorithm for modulus of matchings. Using Python, a high-level programming language, the algorithm is constructed and examined. Algorithmic complexity will be analyzed and identified, namely we want to know how fast or slow the algorithm performs. Primary articles will be reviewed and identified to help assess the complexity. We will specifically look at different run-times of different sizes of graphs, with Python. Graphs, G, will consist of a set of nodes, V, and a set of edges, E, denoted as $G=(V,E)$. Even though theoretically the algorithm has $O(n3)$ complexity, in practice it is worth knowing how long it takes to run for medium-sized graphs. Conclusions from this project will give us an idea of the run-time and will help set the path for future work relating to the modulus of matchings.

Anyone Can Exercise: An Evaluation of a Free Campus Exercise Program

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Physical activity levels tend to decline as students transition from high school to college, and college students report numerous exercise barriers. It is possible that providing free exercise classes at a convenient time and a location would help alleviate barriers such as lack of transportation, time and resources, but it is unknown whether such a class would be widely utilized. The purpose of this study was to determine whether college students would attend a free exercise class on campus, and to identify reasons for attendance and non-attendance of the class. The class was designed to last one hour and incorporate a variety of activities suitable for all fitness levels. Advertisement of the program was distributed via email and social media. Participants were encouraged to bring a donation to the Cats' Cupboard. One Sunday evening class was offered but there were no attendees; therefore, a follow up survey was created and distributed to understand the reasons for no attendance. Of the 257 respondents, 8.56% reported they had seen the advertisement, 28.40% said they would attend if they did see the advertisement, and an additional 52.53% said they might consider attending. The top three reasons recorded for not attending were: not sure what the class is (44.75%), the location of the class is inconvenient (24.57%), and the day of the week is inconvenient (24.51%). It can be concluded that extensive advertising efforts to college students are needed to make them more aware of such opportunities, and the targeted population should be those who do not already have free access to the recreational center on campus.

Vietnam's Natural Hazards

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The number of major natural disasters and hazards has become a global challenge, and Vietnam is one of the countries most affected by natural disasters (McElwee, 2010). Each year, Vietnam is subject to many different natural hazards, including typhoon, flood, flash-flood, and landslide events. Since the 1990s, natural disasters in Vietnam have become more dangerous to human life, property, the economy, and the environment because of the impact of climate change (National Report on Disaster Reduction in Vietnam 2005). This study defines "natural disasters" and "hazards" in the context of Vietnam and examines the changes in livelihood, environment, and health condition due to natural disasters. Besides the negative impacts of natural disasters, the misunderstanding of natural hazards, the lack of preparation before the event, and reconstruction after the event increase the vulnerability of residents. The impacts of natural disasters relate to education level and household income; the lack of governmental policies also plays an important role in determining the impacts. People need support from the government to prepare and protect their life and property. "Resilience" and "adaptation" become the important keys to reduce the impacts of natural hazards.

Novel Promoter-Controlled Expression of Proteins Selectively in Tumor Cells Using Whole or Fragmented Plasmid Sequences

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The progression elevated gene-3 (PEG-3) promoter drives a rodent gene that has shown strong activity in tumor progression. Demonstrating tumor specificity and activity in at least five different human cancers, it is considered a novel promoter for tumor-specific gene expression. The cytomegalovirus (CMV) promoter is commonly used in mammalian expression vectors to drive gene expression. In this study, we aim to use the PEG-3 promoter to express a therapeutic gene, cytosine deaminase (CD), specifically in cancer cells. This CD "suicide gene" encodes an enzyme which catalyzes the conversion of a nontoxic prodrug, 5-fluorocytosine, into a toxic drug, 5-fluorouracil, to kill tumor cells selectively. The CMV promoter has been used to express reporter genes and will serve as a control for PEG-3 promoter experiments and transfection reagent optimization. Here, we are expressing the reporter DsRed-Express2 fluorescent protein. Using the CMV promoter, cancer cells and normal cells have been transfected with whole-plasmid sequences or fragmented plasmids containing promoters and target gene sequences only. The PEG-3 promoter, subcloned in a pcDNA3.1 vector with DsRed-Express2 and CD, will undergo *in vitro* transfection of mammalian cells. Transfection allows us to introduce the genes into normal cells and cancer cells. Qualitative real time polymerase chain reaction (PCR) will allow for confirmation of target gene transcription. PCR and PCR purification are our methods of fragmented plasmid sequence amplification. Fluorescence microscopy is used to check the expression of the reporter genes. Transfection using fragmented plasmid sequences has unexpectedly shown long-term stable expression. This is of interest for comparing transfection efficiency. Our results should also yield further understanding of the tumor-specificity of the PEG-3 promoter. Demonstrating the controlled expression of the "suicide gene" in cancer specific regions is of interest because it has the potential to serve as a method to treat cancer without affecting normal tissue.

*Ruben is presenting at the American Association for Cancer Research Annual Meeting in Chicago, IL.

Differentiation of P19 cells into neurons

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Alcohol use disorder is a major health problem in the US and in other parts of the world. The economic costs of alcohol use disorder are staggering- $185 billion in 1998 in the US alone. In the brain, N-Methyl-D-aspartate (NMDA) receptors are an important target of alcohol. They are believed to play a role in the development of alcohol tolerance, dependence, and withdrawal syndrome. In our lab we are interested in understanding the molecular effects of alcohol on NMDA receptors. For these studies we employ primary cultures of neurons obtained from mouse fetuses. Our aim in this study was to examine whether an immortalized cell line can be utilized to study the effects of alcohol on NMDA receptors and reduce the need for mouse fetuses. P19 cells are derived from a mouse teratocarcinoma. Upon exposure to retinoic acid, P19 cells differentiate into neurons. In this study we examined whether P19 differentiated neurons express NMDA receptors. P19 neurons were maintained in culture for 8 days. Cell lysate was collected on days 2,4, 6 and 8 after differentiation. We examined protein expression of NR1 and NR2B NMDA receptor subunits by Western blot analyses. Our data showed that P19 neurons express both NR1 and NR2B NMDA receptor subunits with maximum expression on day 8 post- differentiation. The data suggests that P19 neurons could serve as a useful cell culture model to study NMDA receptors.

Shelf-life extension of a refrigerated egg patty and bun for school breakfast

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A breakfast egg sandwich product was submitted for reformulation by its producer when the shelf-life proved to be only a few days, not an ideal time for sale, shipping and storage. The spoilage took form as a black precipitate around the edge of the bun and the growth of molds. Methods include a series of trials conducted by creating the product with alterations in either composition or manufacturing processes, then observing spoilage at both refrigeration and at room temperatures. Attempted trials include the addition of certain preservatives and acids like calcium propionate, ascorbic acid, and EDTA, as well as restructuring the packaging and freezing sequences. Due to the lack of conclusive evidence in hindering spoilage, current trials are being conducted using alternative acids as well as the use of a sourdough bun in an attempt to decrease the pH of the sandwich and reduce spoilage. The goal of the trials is to produce a longer lasting product for the manufacturer without significant alterations in composition or taste affecting the consumer, therefore resulting in an all-around improvement of the product that can be shipped to schools and fed to students.

Maintenance Practices for Prairie-like Green Roof Systems

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Research Project Background - Green, or vegetated, roofs are becoming a prominent option for providing diverse vegetation and other ecological services in harsh growing environments. The exposed environment of green roofs generally requires some type of supplemental irrigation for vegetation to survive (VanWoert, et al, 2005). Increasing moisture to the site invites plant growth and seed germination for both planted and weed species. The Memorial Stadium Green Roofs (MSGRs) at Kansas State University consists of flora native to the local prairie-meadow region. The steep slope (35-40%), substrate depths, (typically 5-6 inches), and grow media or substrate composition (predominantly sandy on the West MSGR, and sandy with expanded shale on the East MSGR) would make it very difficult (or impossible) for vegetation to survive without supplemental irrigation during prolonged periods without precipitation. Maintenance practices such as irrigation, trimming, and weed control are crucial to retaining nearly full coverage of native plants on green roofs in the Flint Hills Ecoregion (Skabelund, et al, 2017). Thus, it is important to assess the maintenance on this unique green roof system to improve how green roofs are managed, especially regarding water use. **Methods** - Substrates were monitored every fifteen minutes for soil moisture content with nine (9) soil moisture and temperature sensors through the 2016 and 2017 growing seasons. An irrigation system (using rotors and pop-up spray heads) applied water overhead to simulate rain-like coverage. Assessing the species richness of the roofs was done by observing species along eight transects on each roof and by visual observation during walkabouts around and on the green roofs. Perceived "nuisance species" were removed as deemed appropriate by the lead researcher. "Weed" species included marestail (*Conyza canadensis*) and tree species such as elm (*Ulmus sp.*) Weeding was accomplished by hand. Supplemental products were applied periodically by the contractor during 2016 and 2017 to supply nutrients and beneficial bacteria to the green roofs and aid in the development of vegetation and create a sustainable soil system (Dixon, 2018). **Results** - Soil moisture data showed that substrate moisture was significantly different between only one of the three sensors placed at a high elevation compared to one of the three sensors placed at a lower elevation after 11 selected storm events during the 2016 growing season (Skabelund, et al, 2017). Intentionally planted or seeded species remained dominant along the eight transects during both 2016 and 2017 growing seasons, but weeds were still present on both roofs despite active weeding activity. W-MSGR weed species were largely controlled compared to the E-MSGR. In July of 2017, researchers pulled roughly 10,000 marestail to prevent further seeding and establishment. Irrigation and weeding techniques should be further explored to provide the most appropriate regime for native plant systems.

References:
Dixon, C. (2018). In Aleman M. R., Skabelund L. R.(Eds.),
Skabelund, L. R., Decker, A., Moore, T., Shrestha, P., & Bruce, J. L. (2017). Monitoring two large scale prairie-like green roofs in Manhattan, Kansas.
VanWoert, N. D., Rowe, D. B., Andresen, J. A., Rugh, C. L., & Xiao, L. (2005). Watering regime and green roof substrate design affect sedum plant growth. Hortschience, 40(3), 659-659-664.

Posters at the Capitol Presenters

Targeted Therapeutics to Treat Cancers Derived from Human Papillomavirus

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Human Papillomavirus (HPV) causes nearly every cervical cancer, with approximately 14 million infections annually in the United States. Kansas is ranked 46th out of the 50 states and Puerto Rico on HPV vaccination percentages, with less than 50% of our citizens being up to date on their HPV vaccinations in 2016. HPV causes 6 different types of cancer by manipulating the host cells. These changes were categorized by comparing data from 144 patients and found increased expression of genes needed for replication and for a DNA damage tolerance pathway, the translesion synthesis (TLS) pathway. This led to the hypothesis that increased cell growth will result in an induction of proteins in this tolerance pathway.

To test this hypothesis, an assay was created to test if cell growth could be modulated by restricting access to growth factors. Human foreskin fibroblasts (HFFs) were grown in a gradient of growth factor concentrations. When the cells with the highest concentration of growth factors neared confluence, all cells were harvested and counted. Consistent with access to growth factors modulating cell growth, this data showed an increase in cell growth with increasing growth factor concentration. Proteins from parallel treated cells were also harvested and showed that TLS protein levels mirrored growth rates.

Despite higher TLS protein levels, HPV-caused cancers cannot utilize the DNA damage tolerance pathway. This inhibition sensitizes cells infected with HPV to an existing class of cancer drugs, DNA crosslinkers, indicating a potential targeted drug against HPV-derived cancers.

Fatty Acid, Phospholipid and Sterol Composition of Salt Cedar (Tamarix spp.) Roots

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The salt cedar, Tamarix spp., is found mostly in the southwestern U.S., originally coming from Eurasia. A lot of beneficial properties are not widely known. As one example, Tamarix absorbs a large amount of boron without being damaged. Tamarix can help clear up boron contamination, that was created by burning fossil fuels, running power plants and landfills. Tamarix could be used to keep boron localized; preventing it from going into the ground water. Tamarix can live up to 100 years.

Our initial hypothesis was, that boron resistance may depend on altered root membranes. Tamarix proved to be resistant to boron up to 200 mg/L (ppm) in hydroponic growth experiments with the duration of up to three months. The aim of this study was to explore routes of boron transport in Tamarix. First, we looked at root lipids including fatty acids (FA), sterols and phospholipids, analyzed by different methods. The root FAs were analyzed by gas chromatography. Lipid types were determined via thin layer chromatography (TLC). In another experiment lipid composition of phospholipids was determined by mass spectrometry (MS). There were no major differences in the root lipids between treatments, caused by boron. Composition of phospholipids was not altered in levels up to 200 ppm of boron in the nutrient solution. It appears that boron tolerance does not depend on changes of root lipids in Tamarix. The next step is to examine root membrane proteins.

University Award for Distinguished Undergraduate Student in Research

Action Recognition in 3-D Video Data of Animal Subjects Using Deep LSTM Networks

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Action recognition from 3-D video data remains a crucial and challenging problem in computer vision. Current research focuses on using recurrent neural networks (RNNs) for recognizing human action using the trajectories of human skeleton joints. However, there is a lack of research in action recognition for animal subjects; advancement in this area could help develop a tool for researchers to analyze video data of their animal models. In this work, our goal is to develop a Long Short-Term Memory (LSTM) recurrent neural network (RNN) for dense trajectories and skeleton-based action recognition for animal subjects. From video data, the LSTM network extracts feature representations and models the subject's motion based on the time-referenced sequence and trajectory of skeleton position. To train the LSTM network, we will use rodent behavior video data in a Forced Swim Test (FST), an animal model to test the efficacy of antidepressant drugs and extract motion vectors from the videos. To ensure transferability across different species and motion experiments, we will also train the model with a home pet and develop a user interface to facilitate training of the network. Our future goal is to apply the network in order to recognize action from real-time video data by calculating joint positions from live video stream using the Kinect Motion Sensor. Potential applications of action recognition of both human and animal subjects can facilitate various applications, such as video surveillance, automated narration of videos for blind people and scoring animal behavioral data.

Honorary Presenter

Black and Yellow Honey Co. in the Making

Landon Karr Smith, 2nd Grade, Maria Ortiz-Smith
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Backyard beekeeping is about learning, finding out if backyard beekeeping is legal, the struggles, and necessary equipment. Beekeeping is important because honey has a lot of medicinal properties and bees are good for the environment. Beekeeping in a residential backyard requires learning the requirements and getting them in order.

This work resulted in working with other beekeepers and elected officials to pass a city ordinance. Community members' mindsets were changed from thinking bees were dangerous pests to appreciating bees and everything they do to help our vegetation. Some may think it's impossible to keep bees in a backyard, but by learning how to take care of them and providing flowers and other food sources it is possible.

Through YouTube videos about myths people thought were true and having conversations with city leaders, the community started to support bees. Continuing to make Facebook videos and presenting at this symposium, teaches the community more about bees. People are learning more about how valuable bees are to our health and the environment.