

15th Annual Capitol Graduate Research Summit

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Featuring Graduate Student Research from:

Emporia State University
Fort Hays State University
Kansas State University
Pittsburg State University
University of Kansas
University of Kansas Medical Center
Wichita State University

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Kansas State University

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ROLE OF THE GUT MICROBIOME IN RESPONSE TO VACCINATION AND VIRAL RESPIRATORY INFECTION IN GROWING PIGS

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Porcine reproductive and respiratory syndrome virus (PRRSV) and porcine circovirus type 2 (PCV2) are two of the most costly diseases affecting the swine industry, resulting in respiratory disease and reduced growth. PRRSV vaccines are used to reduce PRRS-associated losses; however, the currently available vaccines are considered inadequate for disease control. Previous work has shown that the gut microbiome, or collection of microorganisms in the gastrointestinal tract, is associated with weight gain following PRRSV/PCV2 co-infection in unvaccinated pigs. To determine if the gut microbiome is associated with weight gain in pigs immunized with a PRRS vaccine followed by PRRSV/PCV2 co-infection. Twenty-eight days post-vaccination and at the time of PRRSV/PCV2 challenge, fecal samples were collected from 50 pigs. At the conclusion of the study, 20 pigs were retrospectively identified as having high or low growth rates during the co-infection period and fecal microbiomes were characterized using a microbial detection array. Average daily weight gain was significantly higher in high growth rate pigs. At the level of the fecal microbiome, several bacteria were found at a higher rate in high growth rate pigs and may be beneficial for improving the growth response during vaccination and viral infection; specifically, increased species in the genera *Megasphaera*, *Spirochaeta* and *Prevotella* as well as increased Clostridiales species were detected in high growth rate pigs. Microbiome composition may improve PRRSV vaccine efficacy and disease response during PRRSV/PCV2 co-infection. Ultimately, modulating the piglet microbiome to have beneficial characteristics may be an alternative tool for disease control.

SOIL MICROBIAL COMMUNITY SHIFTS DUE TO DIFFERENT FIRE SEVERITIES

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Wildfires burn large areas of forested land annually, and the frequency of these fires is projected to increase. This study compares fires of differing severities and their impacts on soil microbes. This study aims to gain deeper insight on the dynamics of soil microbial communities following an extreme high severity fire event. Ten pairs of plots were established in the Pringle Falls Experimental Forest in Oregon. For each pair, one plot served as a background control (low severity burn), whereas another mimicked a whole log combustion and included logs piled in 1.5m x 8m x 1m structure for added fuel (high severity burn). The soils were sampled from 0-10cm in depth at each plot before the burn, one week after the burn and 2 and 4 years after the burn. DNA was extracted from these soil samples, and DNA-barcode regions (ITS2 for fungi; 16S for bacteria) were PCR-amplified. Amplicons were sequenced on MiSeq Illumina platform and microbial communities compared using R. Fungal communities shifted dramatically in high severity burn treatment, remained distinct from the pre-fire conditions after 2 years and we expect also after 4 years. The bacterial data analyses remain to be completed, but we expect similar responses in the high severity fires following the fire event, but with a faster recovery as a result of their faster generation time. Wildfires can have a lasting impact on organisms above ground; our research shows that high intensity disturbances cause a long-term impact on microbial communities.



DEVELOPMENT OF EVIDENCE-BASED SCHOOL LUNCH BEST PRACTICES: A CRITICAL REVIEW

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The National School Lunch Program (NSLP) was developed to provide healthy food to schoolchildren. Participating schools' lunches must meet NSLP nutrition standards. Research has shown that there may be significant variations in dietary quality (DQ) of school lunches while meeting standards. DQ is associated with child and adult weight status, chronic disease risk, and academic performance. Thus, the purpose of this study was to review previous research on child DQ recommendations and implementation of healthy school lunches, and to develop best practices for healthy school lunches based on the evidence. Relevant studies, published in the last ten years, were systematically identified using PubMed and Scopus. Keywords and search strategies were determined *a priori* with professional librarian assistance. Two independent reviewers assessed included studies for methodological quality, according to Academy of Nutrition and Dietetics Evidence Analysis Library criteria. Results were summarized and used to develop best practices for schools planning healthy lunches. Twenty-one articles met inclusion criteria. Best practices to improve DQ of school lunches included increasing dairy, fruit, non-starchy vegetables, nuts and seeds, whole grains, lean meat/poultry, eggs, and fish, and decreasing/minimizing red/processed meat, total and saturated fats, salt, refined grains, and pre-fried/fried foods. Implementation techniques that improve selection and consumption of healthy foods included use of nudge strategies and Smarter Lunchrooms interventions; increasing normativeness, convenience, and attractiveness; including students in planning and implementation; and marketing healthy foods to schoolchildren. The current study suggests that development of best practices, including implementation, for healthy school lunches may improve NSLP DQ.

CALIBRATION OF HIGHWAY SAFETY MANUAL FOR 4-LEGGED SIGNALIZED INTERSECTIONS AT URBAN AND SUBURBAN AREAS IN KANSAS

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The Highway Safety Manual (HSM) provides various Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) for different types of facilities at urban locations in order to predict the expected crash frequency at these facilities depending upon the Average Annual Daily Traffic (AADT), traffic control features and geometric characteristics. The main objective of this study was to calibrate the HSM SPFs for 4-leg signalized intersections (4SG) at urban and suburban areas and develop a calibration factor for the state of Kansas. A sample size of 198 was determined from 55 urban cities from the state of Kansas. Based on the availability of recent data, the study period was determined to be a three-year period, from 2013 to 2015. The data elements required for the calibration process mentioned in the HSM Part C, Chapter 12, were obtained from various sources and the calibration procedure provided in the HSM Appendix A was followed. From the sample size of 198, the calibration factor is calculated to be 1.1739 for total crashes and 2.0089 while considering fatal and injury crashes. The calibration factor greater than 1 implies that the actual number of observed crashes were higher than the predicted number of crashes. The calibration factor developed can be used to predict the total number of crashes in the future at 4-legged signalized intersections in the state of Kansas and suitable countermeasures can be used. However, this calibration factor needs to be recalibrated in the future to accommodate the change in traffic features.

INSPIRING FUTURE CONSERVATIONISTS THROUGH A JUNIOR ZOOKEEPER PROGRAM

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The recent decline in children's engagement with nature due, in part, to our increasingly urbanized lifestyles, may produce future leaders less inclined to value and protect wildlife. Sunset Zoological Park in Manhattan, Kansas, has been a cultural and educational asset to the community for more than 80 years and is passionate about facilitating up-close explorations of wildlife as part of their mission to inspire conservation of the natural world. The Junior ZooKeeper program is a participatory summer career-shadowing opportunity for 10 -13 year olds, which allows them to re-engage with nature and discover career opportunities in wildlife conservation. This qualitative study assessed the cognitive and affective impacts of the Junior ZooKeeper program on participants. A total of seven group interviews (45 min each) of participants (n = 25) were conducted June – August 2016. Interviews were coded by three reviewers to identify themes expressed by participants. Emergent themes included a positive shift in thinking about wildlife, positive perceptions of science-based careers, and a greater understanding of the role of zoos. Results support the importance of immersive nature-based opportunities for education and exploration, and highlights the potential for similar career-shadowing opportunities to inspire today's youth to become future conservation leaders.

SUSTAINABLE RESOURCE RECOVERY FROM MUNICIPAL WASTEWATER IN A PILOT-SCALE ANAEROBIC MEMBRANE BIOREACTOR (ANMBR) AT FT. RILEY, KS

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Municipal/agricultural wastewater treatment consumes energy and resources, while there is great opportunity to sustainably recover these resources (water, energy, and nutrients). Anaerobic membrane bioreactor (AnMBR) technology is a promising alternative to aerobic wastewater treatment, including activated sludge and oxidation ponds. The Department of Defense's Environmental Security Technology Certification Program (ESTCP) has funded a demonstration project at Ft. Riley, Kansas from 2016 till present, to evaluate a pilot scale gas sparged AnMBR for sustainable municipal wastewater treatment. This pilot system is one of the world's largest, treating upto 1000 gallons of wastewater/day, under ambient temperatures. Reactor was started up with anaerobic digested sludge from Topeka, KS in July 2016, followed by treatment and energy optimization. Weekly samples were collected for chemical analyses throughout the startup (3 months) and continuous demonstration phases (12 months). The pilot scale AnMBR demonstrated that we achieved effluent Biochemical Oxygen Demand₅ (BOD₅) close to 10 mg/L, meeting the ANSI reuse standards, while reaching Chemical Oxygen Demand (COD) values below 60 mg/L, and superior capture of Ammonia-N and Phosphorus from the wastewater as valuable products, at 99% and 90% efficiencies, respectively. This high effluent quality was achieved at a 12-hour Hydraulic Retention Time (HRT), with a net flux of 7 Liters per Square Meter per Hour (LMH) consistently, suggesting its viability for implementation. Overall, the performance of the AnMBR suggests its potential as a sustainable wastewater treatment technology, with an even greater viability when applied to agricultural wastewaters, since it works better at higher loading rates.



OPTIMIZING THE DESIGN OF THE KANSAS MESONET ENVIRONMENTAL MONITORING NETWORK

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The Kansas Mesonet is a state-wide network of 56 environmental monitoring stations broadly used for weather and flash flood forecasting, assessment of agricultural droughts, daily farming decisions, and wildfire preparedness. Long-term, accurate, and spatially unbiased observations are mesoscale (~few hundred miles) environmental processes and forecast potentially hazardous events. However, the Kansas Mesonet lacks an objective method to site new stations. The objective of this study is to develop an unbiased method to determine the optimal locations of new Kansas Mesonet stations. The method consisted of the following steps: i) delineate all unmonitored areas across the entire Kansas Mesonet network using all possible subsets of current stations; ii) identify the largest unmonitored area; iii) find a tentative location for the new station by calculating the centroid of the largest unmonitored area. To account for hazardous environmental events potentially concentrated in specific areas of the state, we also included long-term geo-referenced records of severe thunderstorms and wildfires in our analysis. Next station should be deployed ten miles West of Madison, KS (Greenwood county). We discovered the current largest unmonitored area matches the portion of the state with the highest wildfire frequency and is adjacent to the portion of the state with highest frequency of severe thunderstorms. The proposed method allowed us to objectively identify the location of the next Kansas Mesonet station. Deployment of new monitoring stations in South-East Kansas will significantly improve our ability to understand environmental processes and forecast potentially hazardous events and increase public safety.

THE INFLUENCE OF PARENTAL EMOTIONAL SUPPORT ON INCOME AND WELL-BEING DURING THE TRANSITION TO ADULTHOOD: A LIFE-SPAN APPROACH COMPARING SEXUAL MINORITY AND HETEROSEXUAL INDIVIDUALS

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Financial stability is one of the primary tasks of the transition to adulthood (Arnett, 2000) and an important influence on well-being (Kahneman & Deaton, 2010). Additionally, it is important to explore the mechanisms by which parental support during adolescence may improve the ability of sexual minority youth to successfully tackle key developmental tasks. We were interested in how parental support during adolescence predicted income and well-being in adulthood, how optimistic financial expectations in emerging adulthood mediated this relationship, and how income was associated with well-being in adulthood.

Harris et al., 2009). We ran a multiple-group comparison model comparing the experiences of heterosexual and sexual minority (i.e. lesbian, gay, bisexual) individuals during the transition from adolescence to adulthood.

Surprisingly, although income was positively associated with well-being for both groups, optimism for future financial success was only a significant predictor of income and well-being for heterosexuals. Similarly, future financial expectations significantly mediated the associations for heterosexuals only. Financial professionals working with sexual minority adolescents should understand that the well-being of sexual minorities is driven more by parental support and anticipate that a lack of family support may play a role in financial decisions.

EXPRESSION OF ATGRXS17 IN MAIZE INCREASES YIELD UNDER HEAT STRESS

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The human population is currently estimated to rise by a staggering 83 million people per year and reach a global total of almost 10 billion by 2050. This represents an increase of almost 29% from our current population of 7.6 billion people. Maize (*Zea mays* L.) is the largest crop in the world, as well as Kansas, as measured by yield and value. Heat stress has been identified as a serious constraint on grain production, especially if it coincides with flowering and grain filling. Previously, our group has identified the Arabidopsis glutaredoxin S17, *AtGRXS17*, as a key regulator of redox status and heat stress response. Despite this, it is unknown if expression of this gene can influence yield when plants are challenged with heat stress specifically during flowering under field conditions. Yield of three transgenic lines and one wild type control was assessed under a high temperature treatment during flowering (n=4). At VT growth stage, thermostat controlled heat tents were placed over plots designated for heat treatments. These tents remained in place from tasselling through grain filling. Maize plants expressing *AtGRXS17* displayed significantly higher grain yield than their non-transgenic control plants when challenged with heat stress at tasselling through grain filling. These data indicate a possible new approach to engineering heat tolerant inbred lines to be used for hybrid development.

ENHANCE HEALTH WITH A NEW EVIDENCE-BASED TREATMENT FOR DEPRESSION

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Depression, a debilitating illness, is linked to major problems, such as, obesity and suicide. In the U.S., more than 17 million adults suffer from depression annually. The growing economic burden of depression costs \$210 billion a year in the U.S. There is a need for more effective treatments beyond the standard Cognitive Behavioral Therapy (CBT). A treatment that has shown promise but has not been evidence-based for depression is Eye Movement Desensitization and Reprocessing (EMDR) therapy. EMDR therapy, an evidence-based treatment for trauma, uses bilateral stimulation to decrease physiological arousal. This clinical trial compared the effectiveness of EMDR therapy to CBT to treat unipolar depression. Electroencephalogram (EEG) was used to measure changes in alpha asymmetry, which is linked to depression as a biomarker. Fourteen participants with major depression were randomly assigned to receive 10 sessions of either EMDR therapy or CBT over 5 weeks. Participants were 18 years and older. Depression and QEEG were measured at 11 time points. 1. Both treatments were effective in treating depression. 2. The significant decrease in depression in the first three sessions of EMDR therapy produced sustained results. 3. EMDR therapy increase frontal alpha asymmetry. 4. The statistical effect size of EMDR therapy was large (2.58). EMDR therapy can be used to effectively treat unipolar depression. Research with a larger sample is needed.

**NEW KEYS TO OLD LOCKS: CELL MIMICS FOR CANCER TREATMENT****Angelo Andres** and Blake Peterson*Department of Medicinal Chemistry, University of Kansas*

Cell surface receptors are the most common targets of therapeutics. Unfortunately, in some diseases, such as specific types of cancer and diabetes, normal receptors that are targeted are either missing or altered, which prevent them from being modulated by drugs. To overcome this limitation, we seek to develop a novel class of therapeutics based on synthetic molecules that functionally mimic cell surface receptors that are missing or altered in ways that lead to disease. This unprecedented approach is challenging due to the inherent complexity of most cell surface receptors, which are generally capable of rapidly responding to specific extracellular ligands by transmitting extracellular signals across cellular membranes into the interior. For most receptors, these signals are propagated by interactions between receptors and intracellular signaling proteins. To overcome this challenge, and to learn more about fundamental cellular processes, we seek to create the first synthetic cell surface receptors that control specific signal transduction pathways. To develop these agents, we are synthesizing and evaluating peptides related to the tail-anchored protein cytochrome b5, which naturally inserts into the plasma membrane of cells. We are linking these peptides to cholesterol mimics to both facilitate insertion into the plasma membrane and promote endocytic recycling between the surface and early/recycling endosomes, a hallmark of many cell surface receptors. Coupling of these peptides to molecules capable of passing across the cellular plasma membrane and engaging specific intracellular proteins is proposed to provide a mechanism for activating signal transduction.

REPAIRING BONES WITH HYDROGELS**Sayantani Basu**, *Settimio Pacelli*, and *Arghya Paul**BioIntel Research Laboratory, Department of Chemical and Petroleum Engineering,
University of Kansas*

There are approximately 2.8 million cases of head injuries in United States, per year. According to a study with 207 head-injured patients, 37 percent of those with associated intracranial pathology suffered from a skull injury. Skull injury or surgical craniectomy for reducing the increased intracranial pressure, creates a cranial bone defect. This is a challenging clinical problem, since a critical-sized cranial defect cannot heal on its own. Presently available treatment methods largely depend on invasive techniques, where the biomaterial is surgically placed in the defect site. Injectable materials offer the prospective advantage of minimally invasive therapeutic approach, compared to other existing techniques. It can be delivered directly into the defect site along with entrapped therapeutic molecules. Thus, innovative new materials are required to facilitate cranial bone reconstruction. We are interested in developing noninvasive therapeutic approaches in the form of nanoengineered injectable hydrogel with sustained therapeutic delivery. A shear thinning injectable hydrogel based on deoxyribonucleic acid (DNA) and silicate nanoparticles (laponite) have been developed. The developed hydrogel exhibits a sustained release of dexamethasone, thereby showing bone regenerative potential. The hydrogel can be mechanically tuned as well as functionalized with other osteoinductive therapeutic molecules for controlled delivery to the damaged tissue surroundings. The rapid recovery time of these gels will provide a significant advantage by reducing the risk of being washed away after injection. This is due to the immediate self-healing of the physically cross-linked networks after deformation. Thus, our work will eventually help enhancing human health and well-being worldwide, including Kansas.



**RURAL VIBRANCY INDEX:
A MEASURE OF OPPORTUNITY IN RURAL COMMUNITIES**

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This research develops an index to understand the vibrancy of rural livelihoods within specific political boundaries. These boundaries include states within the United States and countries around the world. To do this, the research collects a variety of data to understand the sustainability of rural livelihoods in specific geographic regions, the economic opportunities available to people living in those areas, and the quality of life experienced by rural populations. Because the measurement approach is crucial to this sort of project, the research intentionally focuses on specific indicators to understand vibrancy: access and equity, affordability, community and sense of place, economic competitiveness, environmental quality, and public health. These are in line with previous findings detailed by various Rural Alliance coalitions that focus on the importance of civil society, the levels of public service provision, the importance of the social economy, and the use of local resources. The index, a scaled ranking, will be accompanied by qualitative descriptions that contextualize the variety of forces that come together to impact the quality of life that rural citizens experience. This is particularly important as a single national rural policy will likely not be effective. Rather, broader levels of government should think in terms of tools and financing options, while communities must innovate to enhance the life of people in their jurisdictions.

**COMMUNICATING WEATHER EMERGENCIES TO AT-RISK
POPULATIONS**

Brett Gelino and Derek D. Reed

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One domain in which behavioral economics has the potential to make great impact is that of severe weather incidents and their accompanying warnings. Thousands suffer injury and loss annually from events like hurricanes, flooding, and tornadoes, much of which could have been prevented by following proper precautionary measures. The current study examined delayed reaction by individuals in a hypothetical scenario involving the presentation of emergency weather alerts varying in content and detail. Using an internet-based crowd-sourcing service, assessment focused on residents of states most commonly afflicted by tornado strikes. Participants were presented with warnings that indicated a tornado strike at six increasing temporal delays, representative of lead times expected in real-world events. Results suggest, for those presented with standard emergency alerts, discounting of precautionary measure at rates indicative of potential risk to human well-being; delay of reaction was consistent to that observed in historical tornado strikes. Warnings that contained explicit, impact-based wording prompted less delayed reaction and subsequently more time to adequately prepare for the incident. These findings highlight the need for potential updates to the current emergency alert system and make relevant possible disaster reaction training.

**TURNING BACK TIME: REVERSING ALZHEIMER'S DISEASE PROGRESSION****Erika Nolte and Shirley ShiDu Yan***Department of Pharmacology and Toxicology, University of Kansas*

Alzheimer's disease (AD) is the sixth leading cause of death in the United States, killing more people than breast and prostate cancer combined. Despite this, there are no available drugs to prevent, slow, or cure AD. Yet our research shows that modulating CypD can help improve all major hallmarks of the disease, unlike previous drugs that targeted only one and failed to pass clinical trials. After discovering that AD patients have increased expression of Cyclophilin D (CypD), we created genetic models to test the effect of CypD on the AD phenotype. CypD overexpression in a P301S tau model results in more intense tauopathies, reduced mitochondrial respiration, and anxiety-like behaviors. CypD knock out in the P301S tau background shows striking protection with less hyperphosphorylated tau, better mitochondrial respiration rates, and no anxiety-like phenotype. These results suggest targeting CypD as a promising novel therapeutic approach for AD by reducing AD tau pathology and improving mitochondrial and synaptic function. Using a novel drug screening platform we have recently developed, we have identified several small molecules showing promising activity in suppressing CypD activity. We are evaluating whether a pharmacokinetic CypD inhibitor can create the same protective effects seen in the CypD-deficient tauopathy mouse model. Our CypD inhibitor has shown improvement in behavioral and molecular markers of the AD phenotype, improving tau load, mitochondrial function, synaptic retention, and memory. The inhibitor has been well tolerated by the mice, indicating that it is a good candidate for further drug development and clinical research.

**STOPPING COLORECTAL CANCER BEFORE IT STARTS:
THE MANY ROLES OF THE APC PROTEIN****Taylor Parker and Kristi Neufeld***Department of Molecular Biosciences, University of Kansas*

Colorectal cancer is the third most common cancer diagnosis in men and women. In Kansas, an estimated 1,100 new diagnoses and nearly 500 mortalities will result from colorectal cancer in 2017 alone. Most colorectal cancers (>80%) result from acquired genetic mutations to the tumor-suppressor protein Adenomatous Polyposis Coli (APC). APC is a key regulator of the Wnt signaling pathway as a member of the beta-catenin destruction complex. Mutation of APC is considered to be an initiating event of colon carcinogenesis. Mutant APC results in aberrant Wnt signaling. The rapidly dividing cells of the intestine are carefully regulated by Wnt signaling to maintain cellular homeostasis, and develop polyps when Wnt signaling is deregulated. These polyps can give rise to aggressive carcinomas if not detected and removed at an early stage. The intestinal epithelium is one of the most highly proliferative tissues of the body and is composed of many invaginations known as crypts which are maintained by a small pool of intestinal stem cells (ISCs). ISCs are thought to divide asymmetrically so that one new stem cell and one progenitor cell will result from a single cell division. Evidence in *C. elegans* and human embryonic stem cells suggest that a localized Wnt signal can re-orient members of the Wnt signaling pathway. We present a novel finding that in an intestine-specific setting, Wnt is able to re-orient the beta-catenin destruction complex. The Neufeld lab works to uncover molecular roles of APC and how APC governs cancer progression.



ELECTROCATALYSIS: STORING RENEWABLE POWER FOR TOMORROW

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This project benefits the state of Kansas by working to make renewable energy more cost effective. Currently when the wind is providing more power than can be absorbed by the grid, towers must be shut down. This problem will only increase as we build more wind turbines. This project looks to provide a method of storing the excess electrical generation in chemical bonds, providing a secondary revenue stream for operators of wind turbines. The increase in efficiency will create a powerful incentive to build more wind turbines bringing jobs and money into the rural parts of the state. We accomplish this by enhancing the electrocatalytic conversion of CO₂ to value-added chemicals and fuels. Specifically we are investigating the use of new electrocatalysts and reaction conditions to facilitate these reactions. We are addressing some of the fundamental limitations of CO₂ electroreduction including parasitic hydrogen evolution and CO₂ starvation of the catalyst. The project has developed new reactors to carry out the electrochemical conversion of CO₂ and the research has been successful in increasing the rate of CO₂ conversion. This enhancement of catalytic activity represents a transformational point for the field of CO₂ electroreduction and lend credence to the eventual viability of the technique for industrial application.

SLOW-RELEASE FERTILIZERS TO IMPROVE KANSAS AGRICULTURE

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Ammonia (NH₃) is one of the largest volume chemicals produced worldwide and the production of NH₃ consumes approximately one percent of the world's energy supply. Ammonia is primarily used in the production of fertilizers for delivering nitrogen to agriculture. Today, almost half of the NH₃ delivered via fertilizer to the soil is lost into the environment (air and water). The loss has both energy and environmental impacts. Therefore, the need to develop slow-release fertilizers which can accurately deliver the amount of NH₃ needed into the soil for proper plant nutrition is vitally important. A new class of materials for delivering NH₃ is required and mesoporous materials impregnated with ionic liquids offer such potential. Ionic liquids (ILs) are salts composed of organic cations and inorganic anions and many are liquid at ambient temperature. These advanced materials have grown in attention over the past decade due to the unique properties such as negligible vapor pressure, outstanding solvation potential and tunable physical and chemical properties. Our research focuses on accurately measuring vapor-liquid equilibria (VLE) of NH₃ in ILs at isothermal conditions and various pressures. Pressure-temperature-composition (PTx) data for NH₃ in ILs is correlated using an equation of state to understand the phase behavior under various conditions. The time dependent behavior of NH₃ absorption and desorption in ILs has been correlated using a diffusion model for designing controlled release formulations. The knowledge of NH₃ + IL phase behavior will lead to controlled NH₃ delivery for next generation slow-release fertilizers.



PERCEPTIONS AND EXPERIENCES OF KANSAS BACCALAUREATE NURSING PROGRAM LEADERS RELATED TO NURSING INFORMATICS

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Introduction. Managing patient health information using technology is essential for nurses to promote patient safety. Nursing informatics (NI), a combination of nursing science, computer science, and information science, manages patient health information and improves health outcomes. Since new nurses often lack necessary NI skills required by healthcare settings, nursing program leadership for NI curricular integration is imperative. **Purpose/Aims.** The research purpose was to examine baccalaureate nursing program leaders' perceptions and experiences related to NI in nursing education settings in Kansas. **Theoretical framework.** The study, consistent with naturalistic inquiry, was guided by NI concepts and descriptors. **Method.** This qualitative descriptive study used written surveys and three focus groups. Subjects included nine program leaders, representing 53% of Kansas BSN programs. Research questions explored leaders' understanding of NI and its curricular integration. **Results.** Two major categories emerged from thematic analysis: *Curricular Integration Challenges* and *NI Integration Success Strategies*. Challenges included agreeing on NI definitions, gaining resources, developing faculty, and encountering legal/ethical issues. Success strategies included NI needs assessments and program leadership responsibilities. **Conclusions.** Nursing program leaders found NI an important, but challenging, curricular aspect. Leadership implications include guiding faculty through challenges and NI success strategies. Further research gaining faculty and student perspectives is indicated. **Impact/Benefit to State of Kansas.** Study results can be shared across Kansas nursing programs to inform about current NI needs and best NI practices; potential exists to enhance programs and increase new graduate NI competencies. Nurses more skilled in NI can increase patient safety, health outcomes, and cost-savings.

INTERFERON STIMULATED GENES ARE OVEREXPRESSED IN AROMATASE INHIBITOR-RESISTANT BREAST CANCER AND CAN BE TARGETED TO INHIBIT TUMOR INVASION

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Breast cancer remains the most prevalent cancer in women in the United States. In the state of Kansas 2,180 women were diagnosed with breast cancer in 2017 and unfortunately 300 died of this disease. The majority of breast cancers rely on estrogen to stimulate their growth and survival. Estrogen is made from testosterone by the enzyme aromatase, whose action is blocked by aromatase inhibitors (AIs). Unfortunately, the majority of patients treated with AIs eventually develop resistance and the tumor cells survive even though there is no estrogen present. AI-resistant breast cancer is very aggressive and does not respond well to other treatments. The goal of our lab is to determine the mechanism by which AI-resistance develops. Analysis of samples taken from breast cancer patients indicates that interferon stimulated genes (ISGs) are highly expressed in AI-resistant tumors. ISGs are not normally expressed by cells unless they are defending themselves from viral infections. In this study, we conducted immunohistochemical staining for IFITM1 in 94 human breast tumor samples and discovered that high IFITM1 expression was associated with increased clinical stage and resistance to endocrine therapy. Breast cancer originates in the milk duct of the breast, therefore we used the Mouse Mammary Intraductal (MIND) model to demonstrate that AI-resistant breast cancer cells are more invasive than AI-sensitive breast cancer *in vivo*. We also found that blocking IFITM1 expression prevents AI-resistant breast cancer invasion. Overall these findings suggest that suppressing IFITM1 expression could be an effective strategy to treat and prevent AI-resistant breast cancer.



**DIET QUALITY DURING WEIGHT MAINTENANCE IN RURAL BREAST
CANCER SURVIVORS**

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Breast cancer (BC) was the top cancer diagnosis in Kansas from 1999-2014, with nearly 38,000 new cases reported. However, BC is highly treatable, with the five-year cause-specific BC survival rate currently at 90% (averaged for all tumor stages). Obesity (BMI > 30 kg/m²) is linked to increased rates of recurrence in BC survivors; so finding effective, cost-conscious methods of losing and maintaining weight are key in helping Kansas women reduce BC recurrence. Diet quality plays a role in losing weight, as well as helping prevent development of other chronic diseases such as heart disease, which kills more BC survivors than cancer recurrence. All participants in this study were rural Midwesterner (many from Kansas) BC survivors who underwent the same weight loss intervention: 25 weekly group-based phone counseling sessions focusing on nutrition, exercise, and behavior change. Previous research by this team demonstrated that diet quality improved dramatically during this intervention; this study examines diet quality changes over 12 months between two weight maintenance interventions (biweekly phone-based group counseling sessions vs. biweekly mailed flyers). The improvements in diet quality our participants achieved during weight loss remained consistent throughout the maintenance intervention, regardless of intervention. Our research shows that BC survivors can not only improve their diets, but maintain those improvements over the long-term, and in a cost-effective manner. These results could prove beneficial to an even larger population: the 66% of Kansans who are overweight or obese and at risk for developing chronic diseases such as diabetes and heart disease.

HOME GROWN BIOMEDICAL RESEARCH:

**RESEARCH HIGHLIGHTS FROM THE GRADUATE STUDENTS IN THE
DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY AT
THE UNIVERSITY OF KANSAS MEDICAL CENTER**

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Graduate students are an integral part of the biomedical research enterprise in Kansas. In the department of biochemistry and molecular biology at the University of Kansas Medical Center, twelve graduate students are tackling diverse problems from sickle cell anemia to DNA damage and repair. In the Carlson laboratory, the regulation of glycogen metabolism is investigated to better understand how complex protein interactions control the cell's energy needs. The proteins controlling glycogen degradation are also a therapeutic target to control hyperglycemia in type 2 diabetes. While this work at the medical center improves our understanding of human biology and disease, it also helps advance the laboratory's broader research aims and contributes to continued successful grant applications, bringing thousands of federal research grant dollars to Kansas. While federal funding of biomedical research from the National Institutes of Health is often the focus of science advocacy, state level support of graduate student training through higher education funding should not be overlooked. Cultivating a productive training environment for our future scientists involves institutional funding and support for academic and professional development services. In return, Kansas institutions will continue to produce cutting-edge science and the next generation of biomedical researchers. Visit this poster to learn more about the work being performed in the



department of biochemistry and molecular biology at the University of Kansas Medical Center, how this work benefits human health and our state, and the important role of the Kansas policymakers in sustaining graduate student success.

TRANSCRIPTOME CHARACTERIZATION AND DEVELOPMENT OF TARGETED THERAPY IN JUVENILE NASOPHARYNGEAL ANGIOFIBROMA

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Juvenile nasopharyngeal angiofibroma (JNA) is a benign yet destructive tumor that presents in adolescent males. It typically grows within the nasal cavity and is known to be highly vascularized in association with increased fibroblast cell growth. Surgical resection is currently preferred for treatment, but recurrence rates are as high as 34% with 9% of cases leading to death from hemorrhage and tumor invasion. Because the molecular pathogenesis of JNA is not fully understood, currently no options exist for targeted drug therapy. In this study, we use RNA sequencing to identify potential therapeutic targets in JNA including fibroblast growth factor receptors (FGFRs) and vascular endothelial growth factor (VEGF). We hypothesized that FGFR and VEGF signaling regulates tumor growth and contributes to high levels of angiogenesis in JNA. Immunohistochemical (IHC) analysis of 26 patient samples and immunoblot analysis of fibroblasts derived from primary JNA cultures demonstrated upregulation of FGFRs and VEGF protein. We then tested the success of small-molecule inhibitor AZD-4547, a selective FGFR inhibitor, in reducing tumor progression *in vitro*. Treatment with AZD-4547 produced a significant decrease in tumor proliferation, migration, and invasion. We also assessed the effect of JNA-conditioned media on *in vitro* angiogenesis using a HUVEC (human umbilical vein endothelial cells) tubule formation assay. JNA conditioned media significantly increased tubule formation and use of SU-5416, a selective inhibitor of VEGF, resulted in visible reductions of tubule formation. FGFRs and VEGF play a significant role in JNA progression, and combined use of AZD-4547 and SU-5416 shows promise for targeted therapy.



**QUANTIFYING POTENTIAL THERAPEUTIC BENEFIT OF
SPATIOTEMPORAL DOSE MODULATION FOR CANCER TREATMENT**

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It is estimated to have 14,400 new cancer cases in Kansas in 2017 and radiotherapy remains one of the main modalities to treat them. The goal of radiotherapy is to deliver sufficient radiation dose to the tumor region to eradicate the disease while sparing the surrounding healthy tissues to the largest extent possible. To achieve this goal, radiotherapy plans for individual cancer patients are designed to deliver the desired spatial dose distribution to the patient. The radiotherapy plan will be then used on a daily basis to deliver a fraction of the prescribed radiation dose over the course of the treatment. However, there is biological evidence suggesting that additional therapeutic gain may be achieved if we allow for temporal variation in the radiotherapy plan. This research aims at developing a spatiotemporal radiotherapy planning approach to quantify the potential benefit of varying radiotherapy plans and thus the spatial dose distribution over the treatment course. This gives rise to a large-scale non-convex treatment-plan optimization problem, which is solved using global optimization techniques. The proposed approach is applied to stylized cancer cases to test the computational performance of the solution method and to quantify the potential therapeutic benefit of varying the radiotherapy plan over the course of the treatment. The experimental results show a therapeutic gain (ranging from 2% to 20% depending on radio-biological parameters) can be achieved by using spatiotemporal dose distributions over time-invariant ones.

**THE GREAT DEBATE OF COLLEGE ACHIEVEMENT: WHICH
NONACADEMIC FACTORS CONTRIBUTE MOST TO COLLEGE
READINESS AND SUCCESS?**

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Today, graduating from high school, enrolling in college, and obtaining a bachelor's degree are the primary means of increasing one's cultural capital and subsequent upward social mobility. In fact, many scholars explain that "Education beyond high school is the passport to the American dream." Too often, however, high school graduates enroll in colleges/universities and realize they are not completely prepared for the college environment/culture and academic rigor. Considering these findings, emphasis is placed on which academic factors best predict college readiness/success. The traditional academic indicators (e.g., high school GPA, standardized test scores, etc.) continue to lose their predictive power, and it is now time to investigate nontraditional (nonacademic) factors (e.g., perseverance, social support, empathy, college knowledge, etc.). The aim of this study was to investigate which nonacademic factors improve the prediction of perceived college preparedness and college GPA. Results indicate that nonacademic factors do improve the predictive power for regression models—including traditional academic factors—and improve the prediction of perceived college preparedness and college success. Results also indicate that students who complete all enrolled credit hours during their first semester of college is associated with greater college knowledge, feel confident to continue college, and earn higher college GPAs.



LINGUISTIC DISCRIMINATION AGAINST LATINO RESIDENTS OF
GARDEN CITY, KANSAS

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Previous studies laud the cultural integration of immigrant and established Latino communities in Garden City, Kansas, but substantial anecdotal evidence and a well-documented history of discrimination suggest that some racial tension persists. Part of a larger study on Spanish language maintenance in Kansas, this research aims to analyze perceptions of linguistic discrimination in Garden City. Data consisted of 35 sociolinguistic interviews with Latino residents; meetings with public servants and community/business leaders; participant observation; and an extensive literature review. Interview questions explored participants' conception of the role of Spanish in and outside of the home and how they use the language in different spheres of their lives. Participants also shared memories of discrimination they may have experienced based on language practices in an effort to draw connections between discrimination, language maintenance and ideology. Recordings were transcribed and subjected to sociolinguistic discourse analysis to find correlations between background, language use and discrimination. This study contributes to sociolinguistics by providing information about language attitudes in Kansas, and by describing the sociopolitical contexts in which many Latinos in Kansas use Spanish. Additionally, the study will help build a sociolinguistic database and establish Kansas as a new sociolinguistic region for Spanish speakers in the U.S.

COMPARISON OF TONGUE MUSCLE PERFORMANCE IN SINGERS AND
NON-SINGERS

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Healthy tongue muscle performance is necessary for performing daily tasks such as speaking, swallowing, and maintaining upper airway patency. With age, tongue muscle performance begins to decline and leads to an increased risk of tongue muscle disorders such as dysphagia and sleep apnea. Approximately 68% of adults in care facilities have dysphagia and current rehabilitative techniques provide limited restoration. The purpose of this pilot study was to determine whether individuals who are trained singers display a healthy measure of tongue muscle performance, thereby offering a favorable complimentary rehabilitation method. **Methods:** Thirty ($N=30$) adult participants were grouped as trained singers ($n=15$) and non-singers ($n=15$) and further age-grouped into young adult (18-39 years) and older adult (40-70 years). Participants' tongue strength (TS) and endurance (TE) (anterior and posterior) were measured using the Iowa Oral Performance Instrument. **Results:** A significant difference in anterior TE ($p = .05$) was found with older adult trained singers producing a greater anterior TE than all other groups, regardless of age. **Conclusion:** Findings suggest that singing may beneficially impact tongue muscle performance measures. Singing, thereby, may serve as a complimentary therapy to current rehabilitative methods and further provide a low-cost alternative to health care.



SAFEGUARDING PATIENTS DATA FOR REASONABLE HEALTH CARE COST

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Health care providers including hospitals are required by law to publicly release their patient data, removing explicitly identifiable attributes, such as name, social security number, and address. The release of this data helps research laboratories, and federal and state governments (the state of Kansas in this case) in tasks, such as analyzing geographical movement of diseases, disease eradication, and drug discovery. For a long time, organizations believed the data to be adequately protecting patient privacy as long as all explicitly identifying attributes were removed from it. Motivated insurance companies could perform analyses to decipher people's medical history and raise premiums of those with sensitive medical history, thereby raising the overall health care cost of the society. Several sophisticated data anonymization concepts have since been proposed by the research community, of which t-closeness is a leading one. The currently available t-closeness algorithm is capable of handling only one sensitive attribute, such as a patient's diagnosed disease. We extend the state-of-the-art by building an algorithm that is capable of achieving t-closeness in the presence of multiple sensitive attributes. Our algorithm achieves significant user anonymity and, if adopted to anonymize the data before releasing, will contribute towards lowering the overall health care cost of the society.

PHYSICIAN ASSISTANT STUDENTS SUPPORTING INTEGRATION OF ORAL HEALTH NOW (PASSION)

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Oral health is a vital component of preventive medicine. Routine oral health care is associated with decreases in both systemic infection and heart disease. The American Academy of Pediatrics (AAP) recommends children, beginning at six months of age, receive an oral health risk assessment. In Kansas, 91 of 105 counties have dental professional shortages making routine oral health screenings and prevention inaccessible. These "dental deserts" are most prevalent in western Kansas. Our research focused on educating primary care providers about the importance of dental care, since oral health exams are underutilized across the nation in primary care facilities including those in the state of Kansas. Our research focuses on teaching primary care providers (PCPs) in a rural clinic the importance of oral health screenings and techniques to provide a preventive service of fluoride varnishes to pediatric patients. Wichita State University (WSU) PA students received interprofessional education from the WSU dental hygiene program on fluoride application technique. A rural pilot site in western Kansas was selected. PA students from WSU taught and orientated the PCPs at the site on incorporating fluoride varnish and oral health screenings into routine well-child exams. Data was tracked through coding and billing for services provided. Before the intervention, zero pediatric oral health screenings were completed and documented at the pilot site. Post intervention, an increase is expected in the number of fluoride varnish applications and overall oral health prevention at the pilot site. The study aims to establish precedence for routine preventative oral health care in rural primary care settings.



PROPOSED METHOD FOR CLEAN WATER BY ADDRESSING NITROGEN CONTRIBUTION TO SURFACE WATER CONTAMINATION

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Kansas has serious issues as the result of bio-waste generated by livestock feedlots. The Environmental Protection Agency (EPA) has documented the situation as early as 2004. Action on these issues has languished due to a lack of potential economical solutions. The EPA reports that antibiotics used as growth stimulants and for improved health have the potential of creating superbugs. Large numbers of livestock amassed in a single location produce an enormous amount of waste daily. The stockpiles of manure harbor nitrogen in the form of ammonia that can pollute surface and ground waters before the dried manure is spread on crop lands. The liquid waste ammonia can potentially enter the water shed and stimulate algae growth in surface water. Ammonia that seeps into ground water causes issues with nitrogen pollution of the ground water supply. The proposed solution is economical and will eliminate multiple EPA concerns of surface water and ground water pollution. Eliminating the ammonia migration would improve Kansas State Water quality (both surface and ground). This proposed solution would be to treat the waste via a two-step process. First the ammonia is isolated and then the remainder of the biosolid would be converted into crude oil via hydrothermal liquification (HTL). The HTL process would sterilize all biological components in the waste. The ammonia would provide power for the HTL process with possible excess power that would be considered carbon free electricity. The bio crude would also be considered Zero Carbon fuel since it is produced from recycled carbon.

RETROFIT WINGLETS FOR WIND TURBINES

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Wind power is becoming increasingly important as a source of renewable energy. This is even more so in Kansas, which has the second-largest wind resources in the country. In 2016, 29.6% of the state's energy came from wind. Much research has been devoted to technologies that improve wind turbine efficiency, winglets being among them. Blade tip vortices increase induced drag and affect wind turbine lift generated. This affects power generated and efficiency of turbines. In aircraft, winglets have proven to reduce induced drag. However, winglets tend to increase root bending moments, requiring structural reinforcement and making winglets an expensive proposition. In this study, a retrofit winglet for a baseline wind turbine is designed, and its economic feasibility determined. Traditional methods to determine power output of a wind turbine, such as the Blade Element Momentum theory, are insufficient to model a wind turbine with winglets. A Vortex Lattice Method for rotor applications was developed. Economic feasibility is a key issue in the wind industry today. Accordingly, a cost function that compares design, manufacture and labor costs against increment in power was implemented. These tools, along with researched winglet design philosophy, was used to determine a beneficial winglet configuration for a reference turbine. Using lightweight material and careful configuration designed to minimize root bending moments, a retrofit winglet has been designed that mitigates the need for structural reinforcement of the blade. The resulting winglet configuration, increase in annual energy produced and the resulting profits are presented.



HOW PSYCHOPATHY AFFECTS ATTITUDES TOWARD OTHERS

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Psychopathy has been related to overall negative perceptions of others in past research, but the reason for these negative attitudes is unclear. The current study investigated the relationship between psychopathy and attitudes toward others and attempted to explain these negative attitudes by testing empathy and early maladaptive schemas as mediators and social dominance orientation as a moderator for this relationship. There were 191 participants in the current study; participants first read a short story and took a scale assessing attitudes toward the characters; then, they completed the Interpersonal Reactivity Index, the SDO7, the Young Schema Questionnaire-SF, and the Levenson Self-Report Psychopathy Scale, in that order. Psychopathy was significantly negatively related to empathy and attitudes toward the characters and significantly positively related to social dominance orientation and early maladaptive schemas. Both empathy and early maladaptive schemas partially mediated the relationship between psychopathy and attitudes toward others. These results help to clarify some of the questions surrounding the interpersonal functioning of individuals high in psychopathy and could potentially be used to help create interventions to address these interpersonal deficiencies.

**LONG BONE HISTOLOGY IN AN ONTOGENETIC SERIES OF *CLIDASTES*
(SQUAMATA: MOSASAURINAE)**

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Osteohistology is a well-documented technique used to investigate mechanics, evolution, lifestyle, and growth in extinct animals. Previous osteohistological studies of mosasaurids have focused on adult-sized bones, but no study to date has looked at an ontogenetic series. Here, osteohistology is used to study ontogenetic changes in internal microstructure of the mosasaurid *Clidastes*. This can help in understanding how long it took to reach an adult size, allowing for a clearer picture of the animal's growth rate and lifestyle. Four humeri described as belonging to a neonate, juvenile, sub-adult, and adult were chosen to represent a size gradient. This study found that the medullary cavity of *Clidastes* humeri become less distinct as it is increasingly filled with trabeculae through ontogeny. Because the weight of bone impacts buoyancy in aquatic animals, having an open medullary cavity may have affected diving in juvenile *Clidastes*. All specimens studied contained parallel-fibered bone tissue. Because different bone tissues grow at different rates, this finding indicates a steady rate of growth through ontogeny. However, in contradiction, this study found smaller *Clidastes* humeri to be highly vascular with multiple rows of longitudinal primary osteons and simple canals along with anastomosing canals, while the larger humeri contain far fewer longitudinal primary osteons and simple canals and no anastomosing canals. Decreasing vascular canal density and predominately longitudinal vascular canals in the larger bones indicates decreasing growth rates with increasing size. *Clidastes* grew rapidly as a juvenile, reaching adult size within a few years, and grew much slower through adulthood.



**MULTI-SEASON OCCUPANCY MODELING AND DEVELOPMENT OF
LONG-TERM AVIAN MONITORING PROTOCOLS AT QUIVIRA
NATIONAL WILDLIFE REFUGE**

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In 2014, Quivira National Wildlife refuge in central Kansas initiated a collaborative research project with Fort Hays State University to develop long-term monitoring protocols. As part of this monitoring effort breeding bird point-count surveys focused on grassland bird species were established. Survey transects contained 30 observation points arranged to investigate grassland bird community associations with habitat classifications as defined by the US Fish and Wildlife Service's National Vegetation Classification System (NVCS). Surveys yielded 14,061 observations of 48 species in 2016 and 16,304 observations of 57 species in 2017. Multi-season occupancy modeling and nonmetric multidimensional scaling were conducted to assess bird community relationships to vegetation characteristics at each observation point. As the project progresses, additional analysis of bird communities will be conducted using remote vegetation sensing and the addition of habitat management covariates.

**STRATIGRAPHIC FRAMEWORK OF SILICIFICATION IN THE MIDDLE
SILURIAN CARBONATES OF THE ST. IGNACE DISTRICT OF THE
HIAWATHA NATIONAL FOREST, UPPER PENINSULA OF MICHIGAN**

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Hand samples of the Middle Silurian dolostones in the Hiawatha National Forest, Upper Peninsula, Michigan were measured and collected in order to determine the mechanisms and relative timing of silicification. Silicified features ranged in scale from thick-bedded cherts (microcrystalline quartz) down to microscopic replacement of individual grains. Lower portions of the stratigraphic section displayed the most silicified features, while upper portions of the section displayed little to no chert at the outcrop scale. The most obvious silicified features included silicified fossils, bedded and nodular chert, and megaquartz filled pores. Hand-sized samples were collected with a hammer when possible, and chainsaw drill cores were obtained in instances where collecting with a hammer was impossible. Samples were thin sectioned and analyzed by use of randomized grid patterns. Large-scale observations of the outcrop coupled with microscopic relationships in thin section implied the mechanisms of silicification and silica source. In addition, microscopic observations of thin sections reveal remnant features that are often not preserved in adjacent dolomitized regions. These remnant features (silicified skeletal grains), coupled with textures of the silicified material and petrographic signature of the dolostone, and teased out the mechanisms and relative timing of diagenetic events. Interpretations based on previously overlooked silicified material in these carbonates provided a framework to understand the complete diagenetic history of the carbonates and regional stratigraphy of the St. Ignace District of the HNF.



**QUALITY OF LIFE AND SELF-EFFICACY IN OSTOMY PATIENTS IN A
LOCAL SUPPORT GROUP**

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It is estimated that there are over one million individuals in North America living with an ostomy. This includes a colostomy, ileostomy, or urostomy. The formation of a stoma has a great impact on the patient's psychological, sexual and social well-being and patients need appropriate support to adapt to their new lifestyle. Services related to ostomy care including a local clinic or support group, have not been available in the community for 20 years. Patients travel up to 150 miles for ostomy care or to attend a support group. The purpose is to investigate the effects of a planned 12-week educational program on quality of life (QOL) and self-efficacy in ostomy patients. Synthesis and analysis of supporting literature: Physical and psychological aspects of life have shown to compromise QOL in individuals with an ostomy. Studies found that patients allocated to a specific program had improvement in QOL. Implementation of a support group in a community has shown to be beneficial and improve QOL and self-efficacy in ostomy patients. Project implementation: This quality improvement project, using Roy's Adaptation Theory, took place in Northeastern Kansas and consisted of implementation of a local support group and an organized 12-week educational program. Evaluation criteria: Using a one-group pretest-posttest design, a paired t-test was used to compare the means of the group for QOL and self-efficacy.



COBALT OXIDE DECORATED POLYPYRROLE: A BI-FUNCTIONAL MATERIAL FOR ENERGY STORAGE AND PRODUCTION

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Composites of metal oxide-conducting polymer are very attractive for energy applications. The main objective of this study is to synthesize nanostructured cobalt oxide decorated on polypyrrole using a facile method for energy applications. For this first, polypyrrole was synthesized using a chemical polymerization method. In the second step, a varying amount of cobalt oxide was decorated on polypyrrole using a hydrothermal method. The synthesized materials were structurally and electrochemically characterized. The electrochemical properties were studied using cyclic voltammetry, galvanostatic charge-discharge techniques, and electrochemical impedance spectroscopy. The structural characterizations were performed using X-ray diffraction and scanning electron microscopy. The surface area of the synthesized compounds was measured using BET method. It was observed that the electrochemical properties of the composites depend on their composition. The sample with 300 mg of polypyrrole showed the maximum specific capacitance about 1533 F/g at 1 mV with significant electrochemical stability. The composite retained ~87% of its initial charge storage capacity even after 5,000 cycles of charging-discharging studies. Moreover, these composites showed outstanding performance as an electrocatalyst for oxygen evolution reaction. It required an overpotential of 316 mV to achieve a current density of 10 mA/cm². Our results suggest that composites of cobalt oxide and polypyrrole can be used as bi-functional materials such as for supercapacitors and electrocatalyst for water splitting.

PERSONALIZED DRUG-COCKTAIL NANOMEDICINE FOR THE TREATMENT OF PROSTATE CANCER

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In transfusion medicine, contamination of blood products continues to pose a serious challenge. Importantly, blood platelet concentrates are known to be frequently contaminated with bacteria due to the storage conditions and often leads to a fatal condition sepsis. According to CDC estimates 250,000 Americans die every year from sepsis. Current diagnostic assays for the detection of bacteria in transfused platelets mostly rely on culture based techniques and are often laborious and time consuming. In recent years nanotechnology has been extensively used for the detection of bacterial targets while offering greater sensitivity and faster detection kinetics. This presentation will primarily focus on magnetic relaxation techniques for the fast and sensitive detection of bacteria in platelet concentrates and whole blood using magneto-fluorescent nanosensors. The magnetic relaxation property of our nanosensors enabled low CFU counts detection in whole blood and platelet concentrates. Unique pairing of magnetic relaxation with fluorescence will allow us to discriminate between two potentially contaminating bacteria in platelet concentrates: *Staphylococcus epidermis* and *Ecoli*. Additionally our results demonstrate the potential application of magneto-fluorescent nanosensors for the quantitative assessment of fast and slow growth kinetics of bacteria.



INDUSTRIALLY PRODUCIBLE HIGH-PERFORMANCE CORN-OIL BASED FLAME RETARDENT RIGID POLYURETHANE FOAMS

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Polyurethanes are a sustainable group of polymers used for various applications including automobiles, furniture, construction, packaging, coatings, sealants and much more. In general, polyurethane foams suffer from the disadvantage of high flammability which amplified due to the higher surface with respect to mass density. The global challenge of high flammability of polyurethanes can be addressed by incorporating flame-retardant materials. In this study, corn oil was used to synthesize bio-based flame retardant polyurethane foams. In this process, corn oil was epoxidized and reacted with dibutyl phosphate using a facile ring-opening reaction to produce phosphorous containing polyol. Increasing concentration of phosphorus from 0.5 to 2.0 wt% in the polyurethane foams, showed improved compression strength from 96 to 180 kPa, respectively. The horizontal burning test showed an excellent reduction in burning time. The foams without corn-oil based phosphorous polyol showed burning time of 72 seconds with a respective weight loss of 56%. After addition of corn-oil based polyol to make phosphorus content as low as 1.5%, the burning time and weight loss reduced to 3.8 seconds and 6.4%, respectively. Furthermore, cone calorimeter study showed a significant decrease in heat and smoke release rate, confirming safety against fire as well as released smoke. Our study provides complete understanding for utilization of corn oil as a renewable resource and producing high-performance polyurethane foams which secure public safety, public demand and helping industrial development. This work is supported by Kansas Corn Commission.

THE IMPACT OF HOUSING AND COMMUTERS ON ECONOMIC GROWTH IN PITTSBURG

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The Census Bureau states 63.1% of jobs in Pittsburg, Kansas in 2015 were filled by people not living within the city of Pittsburg. In April 2016, the Kelce College of Business at Pittsburg State University conducted a survey with the help of the Pittsburg Chamber of Commerce to study the working population of Pittsburg. This survey submitted a series of questions including age, income, household size, housing preferences, current home location, as well as infrastructure and/or amenity suggestions. Kelce College of Business found that 70.9% of the jobs within Pittsburg were filled by commuters. The results of the survey showed the 70.9% of people who worked for the major employers commuted in the city and over 50% of commuters in the survey stated that the reason was lack of housing in Pittsburg. The high percentage of people employed in Pittsburg, but who choose to live outside of its limits represents a significant leakage of sales and property taxes for Pittsburg. Pittsburg has consistently been listed with the one of the lowest incomes in the state. The research suggests this is because the majority of high paying jobs in Pittsburg are filled by people commuting into Pittsburg.



**AN ANALYSIS ON NEWS READING AND NEWS SHARING AMONG
STUDENTS AND STAFF OF PITTSBURG STATE UNIVERSITY**

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This research study examines the news reading and news sharing patterns of students/staff at PSU. It specifically focuses on the impact of social networking sites (SSNs) in news reading and news dissemination among the students/staff. The rise of social SSNs has brought in a revolution about how news is received, shared and consumed. Every major newspaper and television channel has a social media presence. University students are a key component in examining and analyzing news reading and news sharing patterns. However, no comprehensive study has been done on news reading, news sharing, social media usage and utilizing SSNs for consumption and dissemination of news among university students/staff. Therefore, this work was an attempt to understand the underlying patterns, if any, related to the above four variables. A survey was conducted among students/staff members at PSU. 111 surveys were considered for the final study. Building on the concepts of news gap (Boczkowski and Mitchelstein, 2013), social news gap (Bright, 2016) and internalizing and externalizing of news on social media (Choi, 2016), this study attempted to understand the following: social media usage among participants; participant's interest in news related topics; and patterns of sharing of news related items on social media. The study found that there was a strong correlation among participants following the internet for news and their preference of SSNs for receiving news. The study also found that while participants engaged in sharing news on their social media feed, they refrained from commenting on news items on SSN feeds.



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LEARNING ANALYTICS AND DROPOUT DETECTION: DEVELOPING AN EARLY WARNING SYSTEM TO SUPPORT POTENTIAL DROPOUTS

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Last year 3,750 students in Kansas dropped out before completing postsecondary education, according to the Kansas State Department of Education (2017). Learning Management Systems (LMS) automatically collect data about student behaviors and performance in a course, such as frequency of log in to LMS, assignment submission logs, and grades. This study seeks to address the dropout problem via use of these student data in order to identify students at risk by creating a predictive model for an early warning system. This can serve to flag potential dropouts so that an institution can intervene to prevent dropout. This study creates a predictive model that alerts potential dropouts at Emporia State University using Canvas data from fall 2017. Statistical modeling is utilized to identify which variables may best predict dropout.

IMPROVING INFORMATION ACCESS IN KANSAS'S RURAL OPPORTUNITY ZONES

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This research investigates an interdisciplinary approach to rejuvenating rural libraries in the State of Kansas using information from local and state geographic organizations. The issue with connecting potential employees to job opportunities in rural communities is a barrier of information. Internet searching challenges, exposed in detail in the field of Library and Information Science, suggest an employee seeking job opportunities in a particular field may experience tremendous difficulty locating available positions due to the inadequacies of natural language processing (e.g., if the job is for a “school librarian” and the searcher enters “library” as the search, this may reveal no results due to the shortcomings of the website). Furthermore, statistics from sources such as Ziprecruiter.com (2017) suggest that job postings experience more success when presented in easily digestible formats, such as a Twitter post, a video, or a map. This format tells the applicant something about the job that is found to be more attractive than a traditional “help wanted ad.” The product of this research is an interactive map of the State of Kansas that enables job seekers, researchers, and the public to explore public libraries throughout the state. These searchers have the convenience of a one-stop resource for all the information needed about public libraries in Kansas, including addresses, telephone numbers, website addresses, social media, links to the primary job posting site for each library, and links to information about Rural Opportunity Zones, for applicable opportunities. This product is easily replicable for industries outside of libraries.

AN INVESTIGATION TO RECOVER AND INDIVIDUALIZE VERTEBRATE DNA FROM THE GI-TRACT OF FLESH EATING BEETLES (*DERMESTES MACULATUS*): A PILOT STUDY

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Mass disasters and acts of violence may leave bodies in pieces, burned beyond recognition, or decayed. Flesh eating insects colonize decomposing bodies and feed upon their remains. Corpses may not be found immediately; therefore, in a forensic investigation being able to sample local insects for human remains would aid in recovery and identification efforts of a missing person. In this study, the objective was to determine if DNA could be recovered from GI-tract of adult



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Dermestes maculatus beetles and larvae reared in three separate colonies. Each colony fed on either *Bos taurus* (beef), *Sus scrofa* (pork) or *Meleagris meleagris* (poultry). A commercial kit was used to extract total DNA followed by a Polymerase Chain Reaction (PCR) that utilized species specific primers. Furthermore, human blood was mixed with beef to mimic a missing human being or body part and then exposed to beetles. The PCR assay successfully amplified DNA fragments and a genetic profile was generated that could be used in the Combined DNA Index System (CODIS) to identify a person. Thus, this research implies that it is indeed possible to recover and individualize vertebrate DNA from the GI-tract of flesh eating insects. This method can be used in forensic cases to identify human remains from a crime scene.

NEAR REAL-TIME ESTIMATES OF KANSAS GDP USING EMPLOYMENT AND OTHER FAST-RELEASE DATA

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This research develops a method to estimate Kansas GDP and derive an economic index that gives a current picture of the level of economic activity on a monthly basis in a more updated way than the Federal government releases. The data provided by the Federal government are credible yet outdated, due to the lengthy ranges between each release. The method is based on times series estimations. First, we use the quarterly data to understand the relationship between GDP and other variables such as employment data and housing sales. Then, we use those relations to estimate a monthly GDP. Finally, we use the known quarterly data to correct the estimate. We are now releasing the Emporia State Economic Index, monthly growth rate, and year-to-year growth rate of Kansas every month on the university website. Emporia State Economic Index provides information about the state of the economy in an accurate and timely way, up to 5 weeks after the end of each month.

Y-SCREENING ASSAY TO STREAMLINE SEXUAL ASSULT SAMPLE PROCESSING AT THE KANSAS CITY POLICE CRIME LABORATORY

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Sexual assault is one of the most serious and common crimes facing society, and it is one of the most challenging offences to investigate in forensic laboratories. The analysis of evidence recovered from rape cases is usually labor intensive, time consuming and problematic because of the significant number of samples that do not yield the presence of male DNA. This results in a high percentage of unresolved and backlogged cases. To address this problem, the main objective of this research consisted of testing and validating a screening technique to rapidly determine the presence of male DNA in sexual assault samples for the Kansas City Missouri Police Crime Laboratory. Semen obtained from female swabs were analyzed in the presence of different body fluids to determine if the screening technique accurately and precisely reflected the presence of minimal amounts of male DNA. Our results indicate that saliva, blood and urine does not affect the amount of male DNA that can be quantified, while mixtures of semen with feces resulted in a better chance to detect male DNA. Using well plates also improved the efficiency of the method. This screening technique is a simple, versatile and efficient method to assist DNA analysts in streamlining sexual assault sample processing. Ultimately, it will reduce the number of backlogged cases in Kansas and surrounding communities and aid in the proper prosecution of sexual crimes.

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