

# 20<sup>th</sup> Annual Capitol Graduate Research Summit

March 22, 2023



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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# University of Kansas Medical Center

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**FIRST RECORDS OF TARDIGRADA IN LYON COUNTY, EMPORIA,  
KANSAS**

**Marielena Banos<sup>1</sup>, Alexis F. L. A. Powell<sup>1</sup>, Stephen D. Fields<sup>1</sup>, and William R. Miller<sup>2</sup>**  
*<sup>1</sup>Department of Biological Sciences; <sup>2</sup>Biology Department, Baker University*

Tardigrades (phylum Tardigrada), also known as moss piglets or water bears, are microscopic invertebrates of marine, freshwater, and limo-terrestrial environments. The low number of tardigrades collected in Kansas, likely a reflection of past survey effort rather than actual occurrence, presents an opportunity for research, including description of new species and localities. Species are described and identified mainly using morphological characteristics (cuticle, claws, and mouthparts). Work to describe tardigrades has increased considerably in recent years—1270 species are known worldwide—however, many are yet to be discovered. Also, few studies have described tardigrade habitats in detail (such as in terrestrial environments, the species of moss or lichen in which tardigrades are found). In Kansas, only 20 previous surveys, limited to northeastern and northcentral counties, have been conducted, wherein 16 species were reported. We have initiated the first study of tardigrades in east central Kansas, starting with Campus Woods Natural Area at Emporia State University, Lyon County. Thus far, after examining 32 habitat samples of 100 total collected, we have found 87 individuals of 4 species. The cosmopolitan species *Ramazzottius baumanni* accounted for 68 individuals and was found in all samples.

**THE EFFECTS OF ART THERAPY ON SELF-REPORTED STRESS AND  
ANXIETY IN ADULTS WITH A TRAMAUTIC BRAIN INJURY**

**Bailey Bennett**

*Department of Counselor Education*

The application of art therapy for those with a Traumatic Brain Injury (TBI) has remained largely uninvestigated as a treatment modality. TBIs are life-changing events for many people and can contribute to the development of anxiety and depression, which are linked to poorer outcomes. Initial studies have shown that art therapy has provided several benefits to the TBI population that could help with the recovery process. The present study aimed to determine whether art therapy could decrease self-reported stress and anxiety in adult participants with a Traumatic Brain Injury (TBI) after one intervention. In this quasi-experimental pre-test post-test single group design, the researcher gathered quantitative data using the State-Trait Anxiety Inventory (STAI) pre-test and post-test. STAI scores were compared to determine if there was any significant difference after participants took part in an art therapy intervention. Results indicated a significant decrease in State Anxiety scores ( $t(7) = 6.7, p < .001$ ) and a significant change in Trait Anxiety scores ( $t(7) = 3.1, p = .018$ ) between the pre-and post-test. The effects of this pilot study support the use of art therapy with the TBI population, and it may serve as an important and helpful therapeutic discipline for individuals recovering from brain injury.



## **UNDERSTANDING THE DYNAMIC RELATIONSHIP BETWEEN TREE STANDS AND WOOD ENCROACHMENT IN THE TALLGRASS PRAIRIE**

**Tucker Eckols**

*Department of Biological Sciences*

Declines in tallgrass prairie exceed those of any other ecosystem in North America, with losses of 82-99%. Prevention of woody encroachment and conversion of tallgrass prairie is necessary. Woody encroachment reduces grassland species diversity. Encroachment is described as replacement of prairie species, especially grasses, by woody species, including trees. Nearby woody plant communities provide propagules for establishment of adjacent prairie and its potential encroachment. Community-level assessments of woodlands and prairies together may provide insights to invasion risk. Our objective is to determine if tree community characteristics can be used to predict probability of woody plant encroachment in adjacent prairies. We hypothesize that there will be a quantifiable relationship between the tree community and likelihood of encroachment of adjacent prairie, with some aspects of the tree community being better predictors than others. Sampling sites consist of 50 x 4 m belt transects placed on the inside edge of tree lines, and three 50m quadrat transects, that extend into the prairie. There are 25 sampling sites at each of three locations in Kansas: Tallgrass Prairie National Preserve, Flint Hills Tallgrass Prairie Preserve, and the Ross Natural History Reservation. Tree data includes species, height, age, diameter, and canopy cover. Soil depth, soil type, slope, and aspect will also be characterized, because they may serve as predictors for encroachment risk. Cluster analysis, Analysis of covariance, and ordination will be used to identify relationships between tree characteristics and encroachment occurrence.

## **ASSESSING BREEDING BIRD DIVERSITY, DISTRIBUTION, AND ABUNDANCES WITHIN IOWAY TRIBAL NATIONAL PARK**

**Brandon C. Franta<sup>1</sup>, Alexis F. L. A. Powell<sup>1</sup>, and Brett Ramey<sup>2</sup>**

*<sup>1</sup>Department of Biological Sciences; <sup>2</sup>Climate Resilience Planner,  
Iowa Tribe of Kansas and Nebraska.*

Ioway Tribal National Park (ITNP) is located in what is now commonly called Nebraska and Kansas (in their southeastern and northeastern corners, respectively). The land consists of rolling bluffs with areas of upland and lowland prairie, together with oak-hickory forest tracts, along the Missouri River valley. Conservation projects are being considered; therefore, baseline data are needed to help anticipate effects of potential stewardship alternatives. From 27 May to 27 July 2022, we conducted surveys of breeding birds and woody vegetation to describe their compositions and distributions in ITNP. Spot-mapping along 19 transects was used to record the geographic locations of birds, which were detected via auditory or visual cues at unlimited distance. Tree and shrub species were identified, counted, and their diameter at breast height (DBH) measured. In total, 68 bird and 32 woody species were identified, including seven bird Species of Greatest Conservation Need in Nebraska as well as seven in Kansas. Future data collection and analyses will include mapping more distributions in 2023 and then measuring strengths of associations between bird locations and woody vegetation parameters such as species diversity, species abundance, tree density and height, and canopy cover, in addition to elevation and slope.



## DIABETIC PATIENTS' DESCRIPTION OF DIABETES MANAGEMENT DURING COVID-19 ILLNESS

Esperanza Garza, **Breanna Gilger**, Juanita Horn, and Emma Shima,  
*Department of Nursing*

Individuals with diabetes mellitus are at an increased risk of severe COVID-19 and mortality in comparison to those who do not have diabetes. This qualitative phenomenology study based on Nola Pender's Health Promotion Model aimed to gain insight from the perspective of individuals with diabetes mellitus on how they managed their diabetes during COVID-19 illness. A purposive sample of ten adult Kansas residents who reported having diabetes at the time of COVID-19 illness self-selected themselves to participate in the study. Responses were collected via an electronic survey and analyzed to identify themes related to management of diabetes during COVID-19 illness. On a day-to-day basis, participants reported utilizing medications, diet, and continuous glucose monitoring to manage their diabetes. During COVID-19 illness, six participants reported managing their diabetes the same as they did prior to having COVID-19. All participants denied hospitalization while they had COVID-19 illness. Eight participants reported that they did not receive any information on diabetic management specifically related to COVID-19. Lastly, five participants reported they did not have access to resources about diabetic management during COVID-19 illness. Gaining insight from the perspective of individuals with pre-existing diabetes on how they self-managed their diabetes during COVID-19 may help healthcare providers better educate patients on how to manage their diabetes during an acute illness such as COVID-19, improving their overall health and wellness.



## **LAUNCHING A NEW GENERATION OF NICOTINE USERS: THE DANGERS OF VAPING IN ADOLESCENTS**

**Alexis Ibarra**

*Department of Nursing, Fort Hays State University*

According to the Centers for Disease Control and Prevention (2021), 68 deaths due to the use of e-cigarettes with associated lung injury have been reported. Vaping has become a popular trend in the movement against combustible cigarettes, especially among adolescents. Many individuals view vaping as a healthier alternative to cigarette use, but the high percentage of nicotine can have lasting effects. The use of nicotine at young ages has been found to harm the parts of the brain that control attention, learning, mood, and impulse control. The U.S. Preventative Services Task Force (2020) recommends education by primary care clinicians to prevent initiation of these substances among adolescents. To combat this health disparity in America's youth, vaping educational programs are necessary. This project sought to implement the CATCH My Breath evidenced-based vaping prevention program into a rural community's middle-school. Advanced health students grades 7th-8th were recruited for the study based on parental consent and student assent. The students participated in four educational sessions over one-month with a pre/post-questionnaire project design. Results showed a 23% increase in student knowledge regarding vaping use. Attitudes towards e-cigarettes and vaping were largely unchanged. Post-intervention results revealed that 97.8% of students reported that the CATCH My Breath program increased their knowledge on e-cigarette and vaping use. The goal of this project was to ultimately change knowledge and attitudes of the study participants to reduce the prevalence of adolescent vaping.

## **RELATIONSHIP BETWEEN BATS AND BLACK-TAILED PRAIRIE DOG (CYNOMYS LUDOVICANUS) COLONIES IN WESTERN KANSAS**

**Mario Rodriguez, Justin Roemer, and Lorelei Patrick**

*Department of Biology, Fort Hays State University*

Although it is known that prairie dog colonies can increase biodiversity in the areas surrounding them, there is extraordinarily little known about the relationship between bats and black-tailed prairie dogs (*Cynomys ludovicianus*). In a recent study from the Front Range of Colorado, several bat species were found to be consistently foraging around prairie dog colonies, purportedly due to increased insect diversity and abundance. Despite the importance of prairie dogs to the ecosystem, prairie dog colonies are usually eradicated due to the perception that their colonies adversely impact cattle grazing by creating holes in the ground that cattle can step in and break their legs, even though there is little to no evidence that this occurs. If insectivorous bats are attracted to prairie dog colonies in Kansas, it would add to the list of benefits of prairie dogs. We conducted acoustic bat surveys, attempted to confirm acoustic detections with mist netting, and sampled insects within and adjacent to prairie dog colonies. We also used novel radio tracking technologies to closely monitor bat use of prairie dog colonies. We will use molecular techniques to identify the species of insects bats are consuming. We anticipated that bats, including Western small-footed myotis (this species was found to be more active over prairie dog colonies than non-prairie dog areas), would forage over prairie dog colonies more frequently than over the surrounding grasslands. Our findings so far support part of this prediction. Significantly more bat calls were recorded over prairie dog colonies compared to non-prairie dog colonies. However, relatively few of these calls were from Western-small footed myotis.



**SUPPORTING WRITTEN SCIENTIFIC EXPLANATIONS OF MIDDLE SCHOOL STUDENTS WITH LEARNING DISABILITIES**

**Steve Skoczek, Hannah Wince, Brooke Moore**

*Department of Advanced Education Programs, Fort Hays State University*

This study examined written scientific explanations of 66 middle-school students with learning disabilities (LD) compared with a matched control group of students without LD following instruction in a science unit with embedded supports for writing explanations. Post unit explanations of students with LD were statistically significantly higher. There were no differences between post-unit written explanations of students with or without LD demonstrating matched gains, yet students without LD demonstrated more growth in overall content knowledge.

**A TOOL FOR VISUALIZING CHARACTERISTIC NEIGHBORHOODS BASED ON RANDOM FOREST REGRESSION MODEL VARIABLE IMPORTANCE VALUES**

**William Wallace**

*Department of Geosciences, Fort Hays State University*

The purpose of this research is to examine the utility in utilizing Random Forest Regression (RFR) Variable Importance (VI) values in characterizing neighborhoods based on the attributes of existing housing units by creating an automated GIS Tool. An important concept that has been implemented in the past in real estate is the concept of Hedonic Price Modeling (Lancaster, 1966), which involves regression techniques to identify the impacts that individual attributes have on the cost of a good outside of mere utility. The benefit of this research is to produce a tool that automates the RFR process such that city planners and GIS professionals with access to ESRI software have the capability of identifying neighborhoods that characterize specific housing value ranges with real-world examples utilizing simple tax data, which is widely available and cheaply accessible. From this research it was found that VI is a viable method for visualizing characteristic neighborhoods based on appraised value and attributes, both spatial and physical attribute.



**DISTRIBUTION AND TOOTH MORPHOGUILDS OF MOSASAURIDS  
(SQUAMATA) OF THE CAMPANIAN WESTERN INTERIOR SEAWAY  
WITH IMPLICATIONS FOR CONTROLS ON MOSASAUR  
PALEOBIOGEOGRAPHY**

**Alec Zaborniak**

*Department of Geosciences, Fort Hays State University*

The Western Interior Seaway (WIS) of North America is well known for its mosasaurid squamate diversity, particularly during the Campanian of the Late Cretaceous. This diversity has historically been examined at a fine scale with many studies investigating the faunal composition of specific assemblages. Mosasaur tooth morphology has also been extensively studied, with tooth characteristics commonly being used as phylogenetic characters. However, many studies examining mosasaur communities and tooth morphology have been focused on broader spatiotemporal or phylogenetic scales. This study investigates the spatial distribution and morphological disparity of Campanian WIS mosasaurs in relation to potentially limiting biotic and environmental factors as well as the importance of online, collections-based resources for paleontological data. Three hundred seventy-four Campanian mosasaur occurrences recorded in online databases were categorized according to taxonomic rank and plotted on paleogeographic maps. Mosasaurines constitute approximately 63% of the total mosasaurid species within the seaway; rüsselosaurines are less common and halisaurines are scarce. Tooth morphoguilds indicative of feeding adaptations were also assigned to each taxon based on preexisting literature and novel measurements of tooth dimensions. The majority of Campanian WIS mosasaurids are found to belong to the 'Cut' guild. Mosasaurines display the highest amount of tooth disparity, with some guilds having a more spatially limited distribution potentially related to a combination of biotic and environmental factors. Many aspects of mosasaur paleoecology and evolution are still poorly understood; further additions to and expansions of online paleontological databases will help create a more complete picture of mosasaur paleobiogeography within the WIS.

## AMERICANS EXPRESS BLIND OPTIMISM FOR OVERCOMING CLIMATE CHANGE

Nicholas P. Gallivan, Christopher J. Harley, Laura, A. Brannon  
*Department of Psychological Sciences, Kansas State University*

The growing severity of climate change necessitates further examination into peoples' beliefs and behaviors related to overcoming it. Differences in Americans' views of climate change are well documented, but limited research has examined the extent to which Americans are optimistic about overcoming climate change and how that optimism relates to other climate change-related beliefs. US-based Amazon Mechanical Turk workers ( $n=180$ ; 39(12) years, 79% White, 53% Democrat) completed an online survey that measured various climate change-related attitudes and behaviors. Participants recorded being optimistic climate change can be overcome [ $M(SD)=4.87(1.56)$  of 7]. While *Support for Mitigative Action* was positively correlated with *Likelihood of Voting for Climate-Concerned Candidates* and *Perceptions of Government Effectiveness*, it was not correlated with *Optimism for Overcoming Climate Change*. However, *Climate Optimism* was positively correlated with *Government Effectiveness*, but not with either of the solution-related variables (*Mitigation Support* and *Voting Likelihood*). Additionally, while no relationship between *Climate Optimism* and *Political Party* surfaced, *Climate Optimism* was positively related to *Belief in American Exceptionalism*. Americans across the political spectrum are optimistic we can overcome climate change, but that optimism is not related to support for the most impactful, top-down solutions for overcoming climate change (i.e., civic and legislative action). Thus, a sense of blind optimism for overcoming climate change may be present, where Americans are optimistic climate change can be overcome, but how that will happen remains unclear. Subsequent research is seeking to confirm these results and to continue exploring potential sources of this blind optimism.

## GRAIN SORGHUM AS A SUSTAINABLE INGREDIENT IN AQUATIC FEED – GRINDING AND PROCESSING ENERGY STUDIES

Tucker Graff<sup>1</sup>, D. Allen Davis<sup>2</sup> and Sajid Alavi<sup>1</sup>

<sup>1</sup>*Department of Grain Science and Industry; Kansas State University;* <sup>2</sup>*School of Fisheries, Aquaculture, and Aquatic Sciences, Auburn University*

In aquatic feed manufacturing, requirements for sustainable ingredients and processing methods are emerging. This research focused on grain sorghum as a sustainable carbohydrate ingredient in aquafeed and studied process sustainability through grinding efficiency and energy inputs. Grain sorghum was ground through 3 hammermill screens (1.27, 1.02 and 0.61 mm) to obtain different particle sizes. Ground sorghum was incorporated into nutritionally balanced diets formulated for shrimp and tilapia and processed through a pilot-scale single-screw extrusion system to produce sinking and floating feed, respectively. As particle size of diets decreased, extruded tilapia feed expansion increased and bulk density decreased (433 to 354 b/L), while energy requirement of the process increased (273 to 335 kJ/kg) leading to improvements of pellet quality aspects including water stability and durability. Higher preconditioner steam loss was observed with lower particle size of raw diets. Increase of thermal energy input into shrimp feed in the preconditioner led to decrease in expansion ratio of pellet from and very little change in bulk density and no noticeable improvement in quality. Higher grinding intensity for grain sorghum improved tilapia feed quality at the expense of higher energy requirements and greater steam loss. Thermal energy input during extrusion did not have a noticeable impact on shrimp feed quality. In optimization of aquafeed processing, quality improvements should be weighed against process sustainability criteria such as energy input and losses. This data will be useful for feed processors to meet sustainability goals within their organization and future regulations in the aquatic feed industry.



**THERE'S A PHOTON IN MY WATER! THE APPLICATION OF  
ULTRAVIOLET LIGHT TECHNOLOGY TO ENHANCE THE SAFETY OF  
AGRICULTURAL WATER ON KANSAS FRESH PRODUCE FARMS**

**Olivia C. Haley<sup>1</sup>, Yeqi Zhao<sup>1</sup>, Trevor Hefley<sup>2</sup>, Logan Britton<sup>3</sup>, and Manreet Bhullar<sup>1,4</sup>**

<sup>1</sup>*Department of Horticulture and Natural Resources, Kansas State University;*

<sup>2</sup>*Department of Statistics, Kansas State University;* <sup>3</sup>*Department of Agricultural Economics, Kansas State University;* <sup>4</sup>*Food Science Institute, Kansas State University*

Ultraviolet (UV) light-based water treatment systems are an increasingly investigated alternative to chemical sanitizers for agricultural surface water disinfection as they are highly effective, user-friendly, and do not produce toxic by-products. However, there are relatively few studies demonstrating the practical use of UV light for on-farm agricultural water treatment applications. The objective of this project was to test the efficacy of two commercial UV devices to reduce the population of *E. coli* in agricultural water. An on-farm study using three agricultural water sources was performed to determine the efficacy of the Minipure MIN-9 (1-9 gallons per minute (GPM), 1.34-gallon capacity) and SARIN (1-130 GPM, 4.75-gallon capacity) UV systems in natural agricultural water. Colilert with Quanti-tray/2000 (LoD 1 MPN/100mL) methodology was used to enumerate the surviving *E. coli* population after treatment at flow rates of 6, 7, and 9 GPM. RESULTS: The efficacy of the devices was dependent on the device ( $p < 0.0001$ ), source ( $p < 0.0001$ ), and the observed transmission ( $p < 0.0001$ ). The SARIN UV system was more effective in reducing the population of *E. coli* in agricultural waters with a high concentration of UV-absorbing particulate matter ( $< 30\%$ UVT). The Minipure MIN-9, however, required a lower capital investment for installation, maintenance, and operation. These results demonstrate the efficacy of UV light for reducing the microbial risk of agricultural water. Further studies are needed using different UV devices, flow rates and transmissions to develop guidance on using the UV technology for conventional or hydroponic produce growers.

**EFFECTIVENESS OF A BRIEF FILIAL THERAPY MODEL ON CHILD,  
PARENT, AND RELATIONSHIP OUTCOMES**

**Lindsay Howard, Glade Topham, and Lindey Schmechel**

*Department of Applied Family Science, Kansas State University*

Filial Therapy is a play therapy parent-child treatment that was developed by Bernard and Louise Guerney in 1964. Filial Therapy helps parents learn and use child-centered play therapy skills to engage with their children, thus improving the parent-child relationship. There have been many studies examining the effectiveness of Landreth's group model of Filial Therapy (CPRT). However, there have been fewer studies examining the efficacy or effectiveness of the Guerney model of Filial Therapy. This study sought to identify various parent and child outcomes of a brief (10 sessions) Filial Therapy program that was adapted from VanFleet's (1994) individual Filial Family Therapy model. This study included 24 parent-child dyads who completed Filial Therapy and completed a series of pre-tests and post-tests. Parents reported on the following: child behavior problems (Eyberg Child Behavior Inventory), parent distress (Brief Symptom Inventory General Severity Index), and parent acceptance of child (Porter Parental Acceptance Scale). In addition, independent observers rated parent communication of acceptance, parent involvement, and allowing child self-direction during parent-child play interactions (subscales of the Measurement of Empathy in Adult-Child Interaction, MEACI). Filial Therapy was found to be effective in promoting positive change in all of the above areas assessed. Effect sizes ranged from .43 to 1.90. These findings indicate that Filial Therapy is effective in decreasing negative child behaviors and increasing positive parenting behaviors within the parent-child relationship. This study highlights the benefits of parents and children participating in Filial Therapy.





## IMPACTS OF WOODY ENCROACHMENT ON GRASSLAND WATER YIELD

Rachel Keen<sup>1</sup>, Pamela Sullivan<sup>2</sup>, Zak Ratajczak<sup>1</sup>, Walter Dodds<sup>1</sup>, Jesse Nippert<sup>1</sup>

<sup>1</sup>*Division of Biology, Kansas State University;* <sup>2</sup>*College of Earth, Ocean, and Atmospheric Science, Oregon State University*

Grasslands and rangelands globally are experiencing woody encroachment – the spread of trees and woody shrubs in historically grass-dominated ecosystems. This process reduces plant biodiversity and forage availability and is increasingly recognized as a threat to water yield because woody species use substantially more water than grasses. In this study at Konza Prairie Biological Station, we used measurements of water-use by shrubs and grasses as well as a historical spatial dataset of vegetation cover to estimate daily watershed-scale water loss through time as woody cover has increased. Previous work has shown that shrubs use water at roughly twice the rate of grasses. We found that woody cover increased by ~20% from 1978-2020, resulting in a ~25% increase in daily water-use in a 53.9 ha watershed. This drastic increase in water-use has likely contributed to observed declines in streamflow at Konza Prairie since the 1980's. We also found that the relationship between streamflow and incoming precipitation has broken down in recent decades – i.e., stream discharge is declining despite an increase in precipitation – and this breakdown is highly correlated with a rapid increase in the rate of woody encroachment in the early 2000's. Greater growing season water-use by shrubs/trees compared to grasses has led to increased watershed-scale water loss as woody encroachment has progressed. This shift has negative implications for water yield on watersheds that support livestock grazing, but also has the potential to impact larger-scale water yield (groundwater, rivers, and reservoirs) across Kansas if woody encroachment continues at a broad spatial scale.

## THE COMPLEX RELATIONSHIP BETWEEN NATIVE MYCORRHIZAL COMMUNITY AND PHOSPHORUS ADDITION IN COMMERCIAL MYCORRHIZAL INOCULANT EFFECTIVENESS

Endy Lopes Kailer and Charles W. Rice.

*Department of Agronomy, Kansas State University*

Arbuscular Mycorrhizal Fungi (AMF) are a group of microorganisms that provide nutritional benefits to around 80% of all plants. Our research aimed to assess the colonization potential of a commercial AMF inoculant with different soil types and phosphorus (P) fertilization. Corn was grown in the greenhouse with three low P non-sterilized soils. Two soils were in current agricultural production, and the other soil was in the native prairie. Treatments included two levels of P (0 and 135 kg/ha of P<sub>2</sub>O<sub>5</sub>) and mycorrhizal inoculation with spores of *Rhizophagus irregularis* (no inoculation and inoculated) with four replicates in a completely randomized block design. Corn aboveground and root biomass were collected after 50 and 70 days. Nutrient uptake in roots and shoots was determined, and mycorrhizal colonization of the roots was assessed. Corn that received phosphorus fertilization had a statistically significant increase from two to four times in growth and nutrient levels (shoots and roots) in all soils. The inoculant did not significantly affect plant growth. Phosphorus fertilization partially inhibited colonization. Plants grown in the agricultural soils were colonized by the inoculant. Corn grown in the native prairie soil was not colonized by the inoculant because of the high populations of native AMF. Commercial inoculants can successfully colonize corn roots in soils from the agricultural sites. Future research will evaluate AMF colonization, corn growth, and yield in field conditions.



## **SURVEILLANCE OF *ECHINOCOCCUS MULTILOCULARIS* IN COYOTES IN THE MIDWEST UNITED STATES**

**<sup>1</sup>Kamilyah R. Miller, <sup>2</sup>Todd M. Kollasch, <sup>3</sup>William Ryan, and <sup>1</sup>Brian H. Herrin**  
*<sup>1</sup>Department of Diagnostic Medicine and Pathobiology, Kansas State University;*  
*<sup>2</sup>Elanco Animal Health; <sup>3</sup>Ryan Mitchell Associates LLC*

Coyotes are routinely trapped for fur trading and nuisance control. Carcasses were collected from Kansas (n=23) and Missouri (n=13). Intestinal tracts were removed, frozen at -80°C for at least 7 days, thawed, and then processed by sifting, filtration, and counting technique to identify adult *Echinococcus* spp. Positive samples, were morphologically and molecularly identified using PCR. Evidence of any other intestinal parasites was recorded. Ten of the 36 coyote carcasses (KS= 8/23; MO= 2/13) were positive for adult *Echinococcus multilocularis*. All positive samples were morphologically, and molecularly, identified as *E. multilocularis* with sequences closely matching previously published sequences. In addition to *Echinococcus* spp., other common intestinal parasites of domestic dogs were detected.

## **PHYSICS IN THE FIELD: APPLICATION OF A FIELD-DEPLOYABLE ULTRAFAST LASER TO MEASURE AGRICULTURAL SIGNIFICANT GASES**

**Lindsay Morris<sup>1</sup>, Chinthaka Weerasekara<sup>2</sup>, Daniel Herman<sup>3,4</sup>, Brett DePaola<sup>1</sup>, Eduardo Santos<sup>2</sup>, Stephen Welch<sup>2</sup>, and Brian Washburn<sup>3</sup>**

*<sup>1</sup>Department of Physics, Kansas State University; <sup>2</sup>Department of Agronomy, Kansas State University; <sup>3</sup>National Institute of Standards and Technology; <sup>4</sup>Department of Physics, University of Colorado Boulder*

Worldwide interest in greenhouse gas emissions have prompted studies into new techniques for remote gas sensing, particularly in agriculture, where enteric fermentation from cattle is one of the largest sources of anthropogenic methane emissions in the US. We focus on measurements of these cattle emissions by deploying a mobile open-path near-infrared dual-comb spectroscopy (DCS) system in the field without the need for external calibration. The previous measurement of methane emissions from a feedlot resulted in time-resolved concentration enhancements of methane, ammonia, carbon dioxide, and water, which we then used in conjunction with weather data to calculate fluxes for these gases of interest. For comparison, the DCS system was run in parallel with a commercial cavity-ring down spectroscopy system, resulting in a methane flux agreement within 6%. Ammonia flux from the feedlot was also measured with part-per-billion precision. Currently, there are no technologies capable of detecting with precision and temporal resolution the methane emissions from grazing cattle, but our previous results show the combination of the DCS system with existing atmospheric dispersion models can fill this void. To verify that, current efforts focus on honing our equipment precision to measure concentration enhancements of approximately 0.2 parts per billion through a controlled release of methane study in a pasture. This is preparatory to measuring net methane production from cattle in a pasture environment. Further development has also focused on the remote capabilities of the system and its robustness against harsh weather conditions and long-term outdoor measurements.

## IMPACT OF CRICKET PROTEIN POWDER ADDITION ON WHEAT DOUGH PROPERTIES AND BREAD QUALITY

Mayra Perez-Fajardo<sup>1</sup>, Hulya Dogan<sup>1</sup>, and Scott Bean<sup>2</sup>

<sup>1</sup>Department of Grain Science and Industry, Kansas State University; <sup>2</sup>United States Department of Agriculture-Agricultural Research Service (USDA-ARS), Grain Quality and Structure Research Unit, Manhattan, KS

Use of alternative protein sources have become more popular due to a continuing rise in population, environmental concerns, and a shift in consumers' demands for eating more sustainable foods. As an emerging novel protein source, insect proteins, provide many benefits such as requiring fewer resources compared to the traditional raising of livestock and having lower greenhouse gas emissions than beef, poultry, and pork. However, not much research has been done on their incorporation into food formulations. This study aimed to see how the incorporation of cricket protein powder would affect the dough properties and the quality of wheat bread. Two commercially available cricket protein powders, Entomo Farms (E) and Griopro (G) were first characterized for their functional properties by evaluating protein solubility and water holding capacities. 10 or 20% incorporations of E and G into wheat doughs were evaluated for dough development properties, dough extensibility, and change in wheat protein composition in the doughs. Breads containing 5, 10, or 20% inclusions of E or G underwent color, texture, and staling analysis. Processing differences led to different cricket protein functionalities which in turn resulted in differing effects on both the dough properties and final bread quality. The incorporation of G led to stronger, more stable doughs with higher water absorption. Dough extensibility and loaf volume decreased at high E and G inclusion levels. Low incorporations of cricket protein powders into bread are feasible. Higher inclusion levels cause the production of dense bread that is not on par with consumer standards.

## PRINTABLE CONDUCTING LAYERED MATERIALS FOR ELECTRONIC AND ENERGY APPLICATIONS

Shiseido Robinson<sup>1</sup>, Rajavel Krishnamoorthy<sup>1</sup>, and Suprem R. Das<sup>1,2</sup>

<sup>1</sup>Department of Industrial and Manufacturing Systems Engineering, Kansas State University; <sup>2</sup>Department of Electrical and Computer Engineering, Kansas State University

The 21st century is majorly focusing on rapid progression on making smart energy storage devices preferably supercapacitors which are linked in development of ultrafast energy harvesting applications. Incorporating intelligence in energy storage devices in electronic device manufacturing industry is most wanted and still meets several challenges. Hence, development of ultra-performance energy storage devices that are manufactured in the process of utilizing thin functional material with low-cost have a great potential to offer biodegradable and recyclable solutions. Two-dimensional layered transition metal carbide (MXene) has been identified as a hot material interest in energy application. Realization of effective use of smart materials in energy applications still has lot of challenging tasks. In this present study, printed highly flexible supercapacitor using few layer MXene ( $Ti_3C_2T_x$ ) ink has been demonstrated, which are prepared from chemical exfoliation process by selective removal of Al (Aluminum) layer from  $Ti_3AlC_2$ . The exfoliated  $Ti_3C_2T_x$  was used as an ink that was patterned onto a desired flexible substrate for fabricate supercapacitor devices. Our fabricated printed devices give high charge storage capacity with high energy densities. The tested multiple charge-discharge cycles validate that our fabricated supercapacitors have extended life cycles. The development of printed flexible supercapacitors using interesting materials is more important to make new energy storage technology. This fabrication process has trailblazed in not only low-cost and safe to our ecosystem but also opened an avenue for future advancements where this energy can possibly be more accessible and available in our daily lives.



## **ASSESSING THE EFFECTIVENESS OF TEACHING DEEP LEARNING FOR MICROCONTROLLERS USING A LINE FOLLOWER ROBOT**

**Bassam Alshammari** and Erik Mayer

*School of Automotive and Engineering Technology*

Deep learning applications, a type of artificial intelligence, have increased significantly in the last decade. This research assessed a hands-on approach to teaching deep learning in an undergraduate microcontroller course in the Electronics Engineering Technology program at Pittsburg State University. Microcontrollers are small computers that fit into a single integrated circuit and are used for specific purposes, such as smart devices for the home. In the course, students learned the fundamentals of deep learning and built a line-follower robot. The line follower robot project used a TI-RSLK MAX robot based on an ARM-based MSP432 microcontroller and was utilized in the Spring 2022 semester. To prepare the students for the line follower robot project, a new concept of deep learning was introduced each week and included hands-on activities. Assessment results demonstrated that 66.7% of the line follower robots developed by students consistently followed the line, 16.7% occasionally left the line, and 16.7% did not work. This showed that, overall, students acquired practical knowledge and could develop deep learning models and deploy them into a microcontroller. Furthermore, even though students used deep learning for an uncomplicated line follower robot, many applications can be built based on the techniques that the students have learned in the project. Research is currently being pursued on identifying the best methods to teach deep learning utilizing microcontrollers for voice and image recognition. Multiple types of microcontrollers and software are being investigated to establish the most effective teaching method.

## **IMPLEMENTATION OF INDUSTRIAL ROBOTS AT CORPORATE AUTOMOTIVE MANUFACTURING FACILITIES IN CENTRAL ASIA**

**Jasurbek Kaynarbekov** and Tatiana V. Goris

*School of Technology and Workforce Learning*

The purpose of the present research study is to investigate the impact of implementation of Industrial Robots at corporate automotive manufacturing facilities on their productivity Central Asian countries (such as Uzbekistan). In addition, the study provides more information about a necessity of robotic lines in automobile manufacturing sectors and its political and economic effects on production and revenue in automobile industry, as well as job market fluctuations in Uzbekistan and neighbor countries. The study design employed is quantitative research methodology and non-experimental design. The painting shop of JSC Tashkent Agricultural Machinery Plant will be taken 48 volunteer participants responding to survey questions. Twenty engineers, twenty technicians and eight managers are invited in the age group of 18-55 years. Two hypotheses expected to be approved such as: Technology skills and artificial intelligence knowledge are challenges for employees in Uzbekistan. If workers improve their technological skills in automobile manufacturing industry and learn new knowledge, they will have more opportunities to obtain better jobs because the demand for high skilled engineers and technicians is so high.



**UniCEN: DEVELOPING INTERNATIONAL LEARNING EXPERIENCE  
IN GLOBAL ENVIRONMENT, SUSTAINABLE GOALS PROJECT**

**Zeshan Shah** and Tatiana V. Goris

*School of Technology and Workforce Learning*

We are pleased to present the results of the recent research study completed by graduate students of Pittsburg State University, KS, USA (<https://pittstate.edu/>) and C. Naryn State University, Kirgizstan (<http://nsu.kg/>) through February–May, 2022. The study was a part of the UniCEN Spring COIL Initiative funded by the by the U.S. Embassy in Tashkent (Uzbekistan) and American Councils for International Education. The core purpose of UniCEN virtual collaborations focuses on establishing substantive international engagement between higher education institutions in the U.S. and Central Asia. The suggested research topics in 2022 offered to jointly address five United Nations Sustainable Development Goals (UN SDGs) such as: clean water and sanitation; affordable clean energy; decent work and economic growth; responsible consumption and production; and climate action. The present study has focused on the fourth goal: responsible consumption and production. Sixteen international graduate students from Pittsburg State University and six candidates from Kirgizstan had been combined into five groups where they worked on chosen themes using Zoom in a variety of formats. As a final step of their collaborations, five YouTube videos with reported findings had been produced by each team accordingly. There is no doubt that a such challenging learning experience was new for all participants. These challenges were caused by student diverse perspectives on the same topics, a significant time zone difference between Kansas, U.S. and Kirgizstan, substantial cultural variances, and mental models. Our presentation outlines the most significant dilemmas faced by students when working on complicated topics in international teams.

**UTILIZATION OF WASTE ORANGE PEELS TO PRODUCE  
SEMICONDUCTIVE MATERIAL FOR ENERGY STORAGE APPLICATION**

**Rishabh Srivastava<sup>1,2</sup>** and Ram K. Gupta<sup>2,3</sup>

*<sup>1</sup>Department of Physics; <sup>2</sup>National Institute for Materials Advancement; <sup>3</sup>Department of Chemistry*

Every year the USA produces tons of oranges; with this line, in 2022, the USA produced approximately 3.47 million oranges and tons of orange peel waste generated by orange juice manufacturer units across the USA and Kansas state. Therefore, we thought to reuse the waste orange peels and employed them for energy storage devices. Since, there is a dire need to synthesize bio-based nanoparticles that are sustainable and inexpensive, with better capacitive attributes which are pivotal keys to acknowledging the rising bio-oriented energy and storage. Herein, we developed highly optimized semiconductive material by using orange peels and accounted for a highly efficient energy-harboring device. A biologically active component of orange peel acts as a reducing agent and forms a cage-like structure to draw the transition metal-based hybrid semiconductive material by using the green approach to synthesize the materials. It showed better outcomes for charge storage property, high power, and energy density similar to batteries and conventional dielectric capacitors. In addition to that waste peels derived semiconductive materials delineated high retention capacity and stability over 5000 cycles. This study offers a facile strategy to fabricate eco-friendly-driven nanomaterials for energy applications.



## RECYCLING REFRIGERANTS TO REDUCE GLOBAL WARMING

**Kalin R. Baca**, Abby N. Harders, Karim Al-Barghouti, Andrey D. Yancey, Arishi M. Abdulrhman, Lucia Matamoros Valenciano, Madelyn G. Bennett, Dorothy M. Haggard, Tessie L. May, Irene V. Xu, Aaron M. Scurto, and Mark B. Shiflett  
*Department of Chemical and Petroleum Engineering, University of Kansas*

Refrigerants play an essential role in technology, comfort, healthcare, and many more applications. Currently, millions of kilograms of high global warming potential refrigerants are being phased out and replaced with more environmentally friendly alternatives due to the 2020 AIM act. Many refrigerants used today are mixtures and often, during use or recovery, the refrigerants are mixed making even more complex mixtures. These complex mixtures make recycling refrigerants difficult because many of these mixtures cannot be separated using the incumbent separation technology available today. Without technology to effectively separate these refrigerant mixtures, millions of kilograms of refrigerant will be vented or incinerated. Project EARTH: Environmentally Applied Research Toward Hydrofluorocarbons is focused on the development of selective, energy efficient, and economical processes for separation of complex refrigerant mixtures so they can be recycled. One of three separation techniques being investigated is the use of ionic liquids. Ionic liquids are liquid salts that are uniquely suited for selective separation of refrigerant mixtures due to their tunable physical properties. The separation process using ionic liquids has been demonstrated at lab scale and validated using modeling. The first pilot scale separation process for separating complex refrigerant mixtures has been designed and constructed and is ready for demonstration at the University of Kansas. This technology is being commercialized by a startup company founded in Kansas and will transform the way refrigerants are reclaimed and recycled in the refrigerant industry.

## ACCESSIBILITY OF WRITTEN MEDICATION INFORMATION FOR PATIENTS WITH VISUAL IMPAIRMENT

**Kara Bamberger** and Cambrey Nguyen  
*Department of Pharmacy Practice, University of Kansas*

According to the CDC 2018 statistics, there were approximately 4.6% of adults in the United States with blindness or serious difficulty seeing. Currently, there are limited options for patients with visual impairment or blindness to obtain accessible written medication information. The objectives of this study were to determine the availability of accessible medication guides provided by pharmaceutical manufacturers and identify common barriers reported by patients with visual impairment in obtaining accessible written medication information in healthcare settings. A total of 39 manufacturers were contacted regarding the availability of accessible medication guides or an alternative format for visual impairment. The majority (36/39) of manufacturers did not provide either. Additionally, fifty medication guides were evaluated for accessibility using a checklist and tested with screen reader technology. Common errors found by the screen reader were lack of a description for images (alternative text) and headings were not available to help with navigation. To identify barriers in obtaining written medication information, respondents were recruited through an anonymous, online survey administered through Qualtrics from September to October 2022. A total of 699 participants responded, and descriptive statistics were used to report the data. The median age was 35, and 49% of respondents were female. Paper copy was identified as the most common format (38%) provided in the pharmacy, and barriers identified included lack of braille or electronic options and personnel not equipped to serve patients with visual impairment. With the lack of accessible written medication information, pharmacists and manufacturers need to provide alternative formats such as audio, electronic formats, or braille to patients with visual impairment.



## **CULTIVATING EQUITY THROUGH 638: HOW TRIBAL SELF-DETERMINATION PROJECTS IMPACT ECONOMIES THROUGH FOOD PROCUREMENT PREFERENCES**

**Kelly Nalani Beym**

*Department of Geography and Atmospheric Science, University of Kansas*

The USDA Food and Nutrition Services (FNS) provides aid to food insecure households through 15 national programs. Of those, only one program mandates a “prohibition on dual participation.” The Food Distribution Program on Indian Reservations (FDPIR) is the only program that serves as a *substitute* rather than a supplement to the Supplemental Nutrition Assistance Program (SNAP). FDPIR is also the only program exclusive to American Indian and Alaskan Natives (AIAN) on or near reservations, yet research shows that AIAN suffer twice the rate of food insecurity with half the average allotment of food benefits. Public Law 93-638, the Indian Self-Determination and Education Assistance Act, grants Tribal Nations the autonomy to operate and administer Federal funding to their tribal communities. In the 2018 Farm Bill, the USDA authorized its first 638 demonstration project for Indian Tribal Organizations (ITOs) that administer FDPIR. The first round of funding expires in 2024 and the second round of solicitations culminated in January of 2023 with a projected start date for Summer 2023. This project seeks to identify how FDPIR 638 meets 2018 Farm Bill priorities through tribal procurement preferences. By analyzing the seven sites selected for the first round of funding, we can compare the purchasing habits of ITOs when granted self-sufficiency of commodity procurement. The main objective of this research is to identify potential impacts to rural economies through localized purchasing power. This research will conduct spatial analysis, program evaluation, and case studies through a mixed methods approach.

## **ENGINEERING A NOVEL INSULIN COMPOUND AS A TYPE 1 DIABETES THERAPY**

**Grant Downes<sup>1</sup>, Amber Griffith<sup>2</sup>, Kyle Apley<sup>3</sup>, Patrick Ross<sup>4</sup>, Mark Farrell<sup>4</sup>, Peggy L. Kendall<sup>2</sup>, and Cory Berklund<sup>1,3,5</sup>**

*<sup>1</sup>Bioengineering Graduate Program, University of Kansas; <sup>2</sup>Department of Medicine, Division of Allergy and Immunology, Washington University School of Medicine;*

*<sup>3</sup>Department of Pharmaceutical Chemistry, University of Kansas; <sup>4</sup>Department of Medicinal Chemistry, University of Kansas; <sup>5</sup>Department of Chemical and Petroleum Engineering, University of Kansas*

Individuals living with autoimmune diseases are undergoing constant internal conflict as a civil war is waged against them. Autoimmunity is the body’s immune system attacking a self-component of the body that should be there, but it cannot be distinguished from an antigen, a foreign invader. In individuals living with Type 1 Diabetes (T1D), the immune system battles with insulin-producing beta cells. These cells are essential workers that produce insulin which is responsible for blood sugar regulation. Without blood sugar regulation, devastating events can incrementally or rapidly arise such as loss of vision, fatigue, organ failure, weight loss, and more. In addition, the financial burden that comes with rising costs of insulin is a significant concern for Kansas families. This concern calls for the development of more potent insulin drug compounds that are more cost-effective in production and therapeutic in nature leading to lower financial, physical, and emotional costs for Kansans. Our unique immunotherapy targets anti-insulin memory cells compared to current insulin analogs on the market that target disease maintenance. We have designed a novel drug construct consisting of insulin linked to a memory cell inhibitor. Tested against anti-insulin memory cells, this construct has demonstrated significant inhibition of successive memory cell growth. Furthermore, upon injection into a preclinical model, this construct traffics to the specific organs where these anti-insulin cells reside. While this work is preliminary, it provides the



necessary framework and highlights the potential of this drug construct as a preventative therapy for T1D directly benefiting Kansans and Americans alike.

## **SECOND-LIFE BATTERY ENERGY STORAGE FOR SUSTAINABLE POWER GRIDS**

**Amir Farakhor, Huazhen Fang**

*Department of Mechanical Engineering, University of Kansas*

A new era of electrification is dawning on us, in which lithium-ion batteries are widely used to decarbonize various key sectors of the economy. The soaring use of lithium-ion batteries will reshape the energy landscape, but also present an increasingly pressing problem: after the batteries complete their useful first life, how to make them live a second life? To put this into perspective, EV sales in the U.S. accounted for 5.8% of all new car sales in 2022 and will surge to 29.5% or about 4.7 million in number in 2030, and on par with this trend, retired EV batteries will exceed 40 GWh per year by 2030. Enabling second-life applications for these batteries will be crucial for environmental sustainability, economic viability, and the resilience of battery supply chains. Meanwhile, the U.S. power grid growingly requires utility energy storage to reach net-zero carbon emissions and ensure reliability under the impacts of climate change. Our research thus aims to repurpose EV battery packs for grid energy storage. Thinking outside the box, we propose a new second-life battery system design technology, which includes novel power electronics architectures and advanced power management algorithms. The technology overcomes some major barriers in using second-life batteries to bring about significant benefits: avoiding the need to disassemble and repackage retired battery packs, allowing scalable integration of batteries of different types or from different manufacturers, and enabling plug-and-play-based installation and operation. Techno-economic analysis shows that our invention holds a significant promise for cost-efficient and long-duration grid energy storage.

## **BUILDING EARLY LITERACY SKILLS AT HOME: INSIGHTS FROM BILINGUAL FAMILIES**

**Samantha Ghali**

*Child Language Doctoral Program, University of Kansas*

Learning an additional language is linked with increased economic mobility and cognitive advantages. Learning another language can help an applicant be more competitive for a job. Learning another language has also been shown to slow down memory loss in older individuals. Learning another language can also help communities build bridges and foster understanding, helping people feel more connected to their neighbors and society overall. According to the Kansas State Department of Education (KSDE), over 160 different home languages are spoken across the state and 10% of the Kansas student population identify as English language learners. However, we don't know very much about how people learn to speak, read, and write in different languages. Learning about how Kansas families help their children learn to be bilingual can help Kansas teachers and districts to design effective educational programs that strengthen Kansas communities. This study asked bilingual families how they help their children learn another language and the strategies they used at home to encourage their children to learn to read. This research directly fulfills KSDE's Title III mission to help all students learn English, to understand challenging State academic content, and to meet state standard requirements. The study's results show that bilingual families use a variety of strategies to help their children learn languages and learn to read. Results from this study will help teachers, administrators, and parents alike in Kansas to provide a solid educational foundation that will positively impact the Kansas workforce.





**PEEK INSIDE THE BOX: GAMIFIED LEARNING OF COMPUTING  
HARDWARE FUNDAMENTALS**

**Tanvir Hossain**

*Department of Electrical Engineering, University of Kansas*

The rapid development of the microelectronics industry nationwide has created a significant demand for engineers, researchers, and technicians who are skilled in electronic hardware manufacturing and assembling. However, nowadays, students are more inclined to software development, data analytics, and artificial intelligence (AI). In high school and undergraduate studies, students get the experience of coding camps and competitions, which motivate them to choose computing related carrier paths. Misconception about semiconductor manufacturing job also discourages students from choosing hardware-related courses during their studies. Moreover, hardware details are often kept hidden in computing courses to simplify the learning and that leads to lack of interest regarding this topic. These impediments have led to the creation of significant shortage of skilled domestic workforce for semiconductor industry. To mitigate this skill gap in microelectronics industry and make students more interested in electronics, hands-on training with a novel learning approach is needed. In this project, we aim to train high school and undergraduate students in Kansas, Florida and beyond through a course with interactive lectures and games developed in easy-to-use hardware platforms. This course covers the fundamental concepts related to electronics, from basics of binary bits to the designing of a circuit system. Moreover, it provides the basic idea of memory and physical security systems of hardware platforms. Learning about hardware fundamentals with hands-on experience with games will motivate students to explore more about microelectronics and choose their carrier in microelectronics. As a result, this will help mitigate the skill gap and workforce demand for future microelectronics manufacturing facilities in this country.

**CAREBOTS DON'T CARE: AN ETHICAL ANALYSIS OF SOCIALLY  
ASSISTIVE ROBOTS IN KANSAS' ELDERLY CARE INDUSTRY**

**Ryan Lemasters**

*Department of Philosophy, University of Kansas*

The state of Kansas has a problem. The demand for care providers in the elderly population is too high and cannot be fulfilled with the current infrastructure. However, there are new solutions to this problem because of advancements in artificial intelligence (AI) and data science. This research reveals the ethical challenges and puzzles of utilizing technologically advance robots in the elderly care industry. I defend two theses. First, relationships with AI raise real ethical challenges to the care ethics framework that dominates within the care industry. Second, the care industry is not currently equipped to handle global implementation of carebots within elderly care. Kansas policy makers have a responsibility to care for its vulnerable populations. If there are technologies that exist that could decrease the chances of people developing serious health problems, this would not only positively affect the health and wellbeing of patients, but it would also substantially reduce government expenses for medical care. Despite the promising benefits of carebots, there are ethical challenges that emerge with implementing carebots in the elderly care community. It is paramount for policy makers to be mindful of the ethical challenges these advance technologies present and develop safeguards against harm. The primary motivation for developing safeguards concerns moral and epistemic harms.



## NATURAL KILLER CELL CHANGES IN PATIENTS WITH POST-COVID-19 SYNDROME TREATED WITH A MUSHROOM SUPPLEMENT

**Samantha A. Cintron<sup>1</sup>, Qihua Shen<sup>1</sup>, Frances M. Yang<sup>1</sup>, and Janet Pierce<sup>1</sup>**  
*<sup>1</sup>School of Nursing, University of Kansas Medical Center*

Persistent symptoms and/or complications lasting at least 4 weeks after having coronavirus disease 2019 (COVID-19) is called post-COVID-19 syndrome. There is growing evidence that immune dysregulation continues after COVID-19 and contributes to the symptoms of post-COVID-19 syndrome. Very limited treatment options are available for these patients and therapeutic interventions are needed. A mushroom supplement has been used in other viral infections to enhance immunologic function via natural killer cell (NKC) activity. Therefore, the purpose of this clinical study was to explore the effects of a mushroom supplement on NKC function in patients with post-COVID-19 syndrome. A one-group pretest/posttest design was used. The study sample consisted of 10 patients with post-COVID-19 syndrome who consumed the mushroom supplement twice a day (3000 mg/day) for 30 days. We collected two 8 mL blood samples from each patient. One tube collected at baseline and one tube collected after 30 days of consuming the mushroom supplement. Leukocytes were isolated and analyzed using flow cytometry. Differences in NKCs were examined using a paired t-test. The mean percentage of CD14<sup>-</sup> to CD56<sup>+</sup> NKC at baseline was 47.68% and significantly decreased to 33.41% after 30 days of consuming the mushroom supplement. Patients with post-COVID-19 syndrome have activation of NKC and consumption of a mushroom supplement may help lower the viral load leading to decreased circulating NKC counts. This study provides essential data for future studies to examine various physiological functions and reduce the symptom burden of post-COVID-19 syndrome in Kansans and others suffering from this syndrome.

## USE OF NOVEL BLOOD BIOMARKERS TO EVALUATE ALZHEIMER'S DISEASE RISK AND BURDEN

**Zachary D. Green, BS, BA, Paul J. Kueck, Casey S. John, MS, Eric D Vidoni, PT, PhD, Jeffrey M. Burns, MD, MS and Jill K. Morris, PhD, *University of Kansas Alzheimer's Disease Research Center, Fairway, KS, USA***

Great effort has been made to identify improved Alzheimer's Disease (AD) biomarkers to aid in screening for at-risk individuals, tracking disease progression, and monitoring response to interventions. The current gold standards for evaluating physiological AD risk and burden are lumbar puncture and neuroimaging. Both methods are costly, time-consuming, and intimidating to patients or research participants. Novel blood biomarkers have emerged that could be collected with relative ease, thus greatly improving our ability to quickly assess disease risk or burden. Two such biomarkers that have shown promise in predicting the brain deposition of amyloid- $\beta$  ( $A\beta$ ), a key protein involved in Alzheimer's Disease, are plasma  $A\beta$  and phosphorylated tau. In contrast, plasma neurofilament light chain (NfL) may act as a global marker of neurodegeneration across various neurodegenerative conditions. Here, we aimed to leverage blood samples collected at the University of Kansas Alzheimer's Disease Research Center (KU ADRC) to examine 1) the ability of blood biomarkers to discriminate cognitively healthy adults with significant brain amyloid burden, a major risk factor for AD, from those without, and 2) the ability of such markers to discriminate between cognitively unimpaired and impaired adults. Consistent with prior works, we found that plasma  $A\beta$  best predicted positive brain amyloid status, while plasma NfL strongly predicted the presence of cognitive impairment. Continued development of these affordable and accessible biomarkers is crucial to the KU ADRC's mission of providing earlier diagnoses, quality assessments of dementia risk/severity, and effective AD treatments to citizens of our state and surrounding communities.



## **RISK FACTORS FOR FAILURE OF CAST IMMOBILIZATION IN PEDIATRIC SCAPHOID FRACTURE PRESENTING GREATER THAN 28 DAYS AFTER INJURY.**

J. Taylor Lacky<sup>1</sup>, **Paige Pearson**<sup>2</sup>, Brian Lee<sup>3</sup>, Micha Sinclair<sup>3</sup>

*University of Missouri-Kansas City School of Medicine*<sup>1</sup>; *University of Kansas School of Medicine*<sup>2</sup>; *Children's Mercy Kansas City*<sup>3</sup>, Kansas City, Missouri

Indications for cast immobilization of pediatric scaphoid fractures presenting in a delayed manner are not well described. We hypothesize that in pediatric patients who sustain a scaphoid fracture, cast immobilization will result in successful union at a lower rate in delayed presentation (>28 days following injury) of displaced fractures with cystic change than acute, nondisplaced fractures without cystic change after 12 weeks of casting. A retrospective analysis of 255 scaphoid fractures treated at a single pediatric hospital between 2010-2020 was performed to characterize: demographic factors, fracture characteristics, amount of cystic change, treatment method, and rate of healing. The primary outcome measure was the rate of healing of scaphoid fractures presenting >28 days from injury with cast immobilization and compared with those treated surgically. Demographic factors and fracture characteristics were compared using Fisher's exact tests. Patients presenting in a delayed fashion were more likely male, injured playing sports, football players, and had closed physes. The fracture characteristics included an increased incidence of a transverse fracture pattern, proximal pole fracture, >1 mm of cystic change, and >1 mm of fracture displacement. Of patients presenting in a delayed fashion, 41.3% were treated with casting alone with a 78.9% union rate compared to 96.1% of acute fractures treated with casting resulting in a 95.5% union rate. The average duration of casting required for healing in the delayed presenting fractures was 63 days (range 53-98). However, patients treated with casting were less likely to have cystic change >1 mm, fracture displacement or fracture comminution.

## **FALLS IN INDIVIDUALS USING WHEELCHAIRS: AN OBSERVATIONAL STUDY**

**Makenna Snyder**<sup>1</sup>, Jacob Sosnoff<sup>2</sup>

*<sup>1</sup>Department of Occupational Therapy Education, <sup>2</sup>Department of Kinesiology*

Falls are a major public health concern facing those aging with disabilities. However, specific attention has not yet been focused on falls in individuals who use wheelchairs. The purpose of this study is to document falls for individuals using wheelchairs in long-term care setting by analyzing videos, characteristics, and consequences of falls. We performed a secondary data analysis on video data collected between April 20, 2007 and June 30, 2014 from two long-term care facilities in British Columbia, Canada. The validated Falls Video Analysis Questionnaire was adapted from the original version to assess the causal, behavioral, and environmental aspects of wheelchair falls. A total of 58 wheelchair fall videos (from 32 individuals) were identified out of 300 total videos (from 118 individuals). Wheelchair falls ( $n=58$ ) were most often caused by incorrect transfer or shift of body weight (70.7%). Residents most often fell backward (56.9%) with 89.7% striking their pelvis during fall. Residents had decreased protective response including only 10.3% demonstrating step response and 8.6% reach to grasp response. Wheelchair brakes were unlocked in 81% of falls. To our knowledge, this is the first descriptive study of observational data for wheelchair falls. This study highlights potential future interventions with the implementation of training to fall safely, targeted ascent and descent transfer training, and automatic wheelchair braking system implementation. Continued exploration of circumstances



surrounding falls and effective interventions are crucial to protect one of the most vulnerable populations in Kansas—individuals who use wheelchairs in long-term care facilities.

## **TELOMERIC RIBONUCLEOTIDES CAUSE RAPID TELOMERE SHORTENING AND TELOMERE INSTABILITY**

**Griffin A. Welfer**, Ryan P. Barnes, Jon K. Alder, Patricia L. Opresko, and Bret D. Freudenthal

*University of Kansas Medical Center, Kansas City, KS. University of Pittsburgh, Pittsburgh, PA.*

Telomeres are nucleoprotein structures that cap the ends of chromosomes to prevent aberrant processing by DNA repair proteins. Telomeres are maintained by a specialized reverse transcriptase called telomerase, which adds telomeric DNA directly to the ends of chromosomes. Ribonucleotides (ribos) inserted by DNA polymerases constitute the most prevalent form of genomic DNA damage. Left unrepaired, ribos can induce genomic instability and are associated with multiple human diseases such as Aicardi-Goutières syndrome and cancer. While the prevalence and impact of ribos has been established across the bulk genome, their presence and impact at telomeres remains unexplored. The gap in knowledge on the effects of telomeric ribos is due, in part, because there has been no way to selectively insert ribos into telomeres. We have overcome this limitation by generating a telomerase variant that inserts ribos as efficiently as it inserts deoxyribonucleotides. This is a powerful tool we have begun using to selectively elevate ribo insertion at telomeres, since telomerase functions specifically at telomere ends. Expression of this telomerase variant in cultured cell lines suggests telomeric ribos cause rapid and significant loss of telomeric DNA. Furthermore, cells expressing our mutant telomerase have dramatic telomere abnormalities and chromosomal fusions. Additionally, using pre-steady state kinetics we have identified two disease-associated telomerase variants that exhibit increased ribo insertion efficiency compared to WT telomerase and we are actively characterizing these variants to understand their significance for human disease. Collectively, these studies are determining how telomeric ribonucleotides contribute to human disease and telomere integrity.



## **INTRA-SHIFT CREW SWAPPING FEASIBILITY AND LIMITATIONS**

**Setareh Darvishi, and Dr. Laila Cure**

*Department of Industrial and manufacturing engineering, Wichita State University*

The provision of effective medical care is critical, and monitoring the workload of paramedics is an essential aspect of achieving it. However, the unpredictable nature of emergency situations makes it challenging to maintain balanced workloads. Currently, emergency medical services crewmembers are assigned to posts for a full 12-hour shift. While this creates a sense of "home" for crew members, it may result in imbalanced workloads due to varying demands at different posts. Consequently, some crewmembers may experience a higher workload than their colleagues during the same shift. To address this issue, this research explores the feasibility and limitations of an intra-shift crew swapping strategy. This strategy involves reassigning crewmembers to different posts at different intervals within a shift to ensure that all crew members experience similar workload levels by the end of their shift.

## **UNREPRESENTED: CREATING EQUITABLE CLASSROOMS IN KANSAS**

**Jason Felihkatubbe, and Kimberly Wilson, PhD**

*Department of Intervention Services & Leadership in Education, Wichita State University*

In July 2022, KMUW, a National Public Radio member station in Wichita, Kansas published an article about the teacher shortage in Kansas. The article states that 4% of teaching jobs, or roughly 1,400, in Kansas are unfilled as more educators leave the profession either to retire early or to pursue another career. Teachers of color were more likely to state their intentions to leave the profession, yet these teachers were not represented in this article. Not surprising given that 90% of Kansas public school teachers identify as White, Non-Hispanic, unlike the Kansas student body, who only 66% identify as White, Non-Hispanic. This is ongoing research that looks at the ways to retain teachers of color in Kansas.



## **EDUCATIONAL CYBERSECURITY INTERVENTION MEASURES FOR VULNERABLE REFUGEE POPULATIONS IN KANSAS**

**Kaitlyn Hemberger<sup>1</sup>, Mythili Menon<sup>1</sup>, Murtuza Jadliwala<sup>2</sup>, and Mohd Sabra<sup>2</sup>**  
*<sup>1</sup>Department of English, Wichita State University; <sup>2</sup>Department of Computer Science, University of Texas San Antonio*

Kansas, a state that receives large numbers of refugees through the International Rescue Committee, suffers from a dearth in research about online protective measures for at-risk communities. In order to address the digital literacy gap between refugees and the general population, Wichita State University and the University of Texas San Antonio will recruit refugees from the Democratic Republic of the Congo (N = 94) this year and from Afghanistan (N = 94) next year for digital literacy workshops in a partnership with Wichita Public Libraries and with the International Rescue Committee. This phase of a larger NSF EAGER project has a series of goals, the first being to assess English proficiency in these communities, the second being to assess digital skills and attitudes, and the last being to understand whether educational intervention helps participants identify cybersecurity threats, specifically vishing and phishing. Through three workshop sessions, each having 25 participants divided based on the LEAP-Q English proficiency test, researchers plan to educate these vulnerable populations on digital literacy, additionally using evaluative checkpoints including measurable qualitative and quantitative data taken from pre-tests (such as a modified SA-6 Scale), post-tests, and mid-workshop activities to inform change in attitude and digital ability.

## **ANALYSING THE IMPACT OF DISTRIBUTED ENERGY RESOURCES ON BULK POWER SYSTEMS**

**Adithya Melagoda, Arun Manoharan, and Visvakumar Aravinthan**  
*Department of Electrical and Computer Engineering, Wichita State University*

The transition from conventional generation to renewables is continuously speeding up in the state of Kansas given its higher potential for solar due to the larger reception of sunlight around the year. A considerable percentage of these renewables include Distributed Energy Resources (DER) which are distributed in smaller individual capacities throughout the network. Although these deployments of DERs bring out ample environmental and technological benefits, the planning, control and operation of power system are getting more complex due to their intermittency. So far, the most common practice of adding DERs to the system is embedding them within the distribution system as a passive load and analysing the impacts on the Bulk Power System (BPS). However, this practice can no longer be accepted due to the increasing integration of DERs and their capability to provide advanced support services as non-synchronous inverter-based resources. Hence, this work provides a novel approach to modelling and analysis of the impact of DERs on BPS performance using four different scenarios of the distribution system. The proposed models are tested in the IEEE 37-bus system along with the transmission-distribution (T-D) interface. The results of this work will be highly beneficial for power system planners and operators in appropriate decision-making to maintain a reliable power system.



**VALUING DISTRIBUTED ENERGY RESOURCE LOCATION BASED ON  
THE IMPACT ON TRANSMISSION NETWORK**

**Sarangan Rajendran**, and Visvakumar Aravinthan.

*Department of Electrical and Computer Engineering, Wichita State University*

The accelerated growth of distributed energy resources (DER), including solar PV, results in unanticipated electric grid operating conditions, as they are traditionally not considered in planning studies by the transmission utilities. The impacts can vary depending on the location at which the DER connects to the existing grid. We have developed three metrics to realize the impacts caused to the grid by the addition of a DER, and find a quantitative value for the location of that DER. This method can be used as a planning tool by the transmission utilities of Kansas to identify the favorable locations for upcoming DERs with respect to their system requirements. A test system developed based on the western Kansas region was used to analyze the impact of DERs and demonstrate the usefulness of the proposed method.

**DEVELOPING A POWER SYSTEM RESILIENCE PLANNING  
FRAMEWORK TO ENSURE ENERGY SECURITY FOR CRITICAL  
RESOURCES DURING POWER OUTAGES**

**Sangar Shanthanam**, and Visvakumar Aravinthan

*Department of Electrical and Computer Engineering, Wichita State University.*

Uninterrupted electricity supply is an essential resource for the US economy. Critical infrastructures such as hospitals and fire stations heavily rely on electricity. However, current trends in weather related events such as polar vortex and tornadoes impact the continuous power supply. When power outages occur, electric utilities try to shed part of the load. These could have both economic impact and power outage to the consumers including critical loads such as hospitals and fire stations. Existing metrics cannot differentiate critical loads and other normal loads during load shedding. For example, 100 kWh of power loss to a hospital and 100kWh of power loss to normal households are considered the same. In this work a metric-based framework is proposed to prioritize critical and important loads. A new quantitative metric called Cumulative Value of Expected Energy Not Served is proposed to value the load based on the criticality. The proposed metric incorporates several types of loads and estimates the total monetary value of expected energy not served. Total value of expected energy not served is determined using survey methods and probability theory. This value can be used to prioritize the critical loads. The developed metric framework could capture the resilience of electric grid effectively. Further, it can give high priority for critical loads therefore energy security for these resources is increased.



## **DECISION-MAKING AT INTERSECTIONS**

**Rachel Sutton<sup>1</sup>**, and Lisa Vangness<sup>2</sup>

*<sup>1</sup>Department of Psychology, Wichita State University; <sup>2</sup>Department of Psychology, The University of Huntsville in Alabama*

Over 90 percent of automobile crashes are primarily due to driver behavior. According to 2015 traffic crash data in the state of Kansas, the number one contributing circumstance of crashes was that the driver failed to give their full time and attention. Accidents regarding the vehicle and driver accounted for approximately 30 % of car crashes in the state of Kansas in 2015. Therefore, as vehicles become increasingly automated, the amount of car crashes related to vehicles may increase in the future, if they are not appropriately calibrated. The current study was designed to assess perceptions of trust and risk by asking individuals to make braking judgements with and without an automated braking system within the context of a driver approaching a yellow light at an intersection. The hypotheses were tested with a Qualtrics survey, where drivers viewed images that portrayed a car at various distances from the light. Each image was paired with a Likert-style question to assess drivers' endorsement of braking at the point depicted in the figure. The results suggested that participants had a bias to endorse braking more strongly when imaging driving a car without automation. By understanding how people's behavior affects their trust in automated systems, it can aid in creating an appropriate reliance, which could reduce crash rates and increase safety in the state of Kansas.

## **MACHINE LEARNING TO IMPROVE THE PERFORMANCE OF COMPUTER-AIDED DIAGNOSTIC SYSTEMS USED FOR DETECTING SKIN DISEASES**

**Christian Thompson<sup>1</sup>** and Abu Asaduzzaman (Zaman)<sup>2</sup>

*<sup>1</sup>Department of School of Computing, Wichita State University; <sup>2</sup>Department of Electrical and Computer Engineering, Wichita State University*

Early detection is critical in enhancing the patient's survival rate due to deadly skin diseases such as melanoma. Most skin diseases are ascertained by extracting sample cells for evaluation. Dermatologists often experience difficulties identifying features during the early stages of skin disease development, which may result in high false positive and false negative rates. The introduction of Computer-Aided Diagnosis (CAD) systems aids a second reader in interpreting medical images. Recent studies show that machine learning (ML) can improve CAD performance. In this work, we implement three ML modules for CAD systems to detect melanoma cancer. ML libraries from TensorFlow and 10,000 training images from Kaggle are used to test the ML modules. The preliminary results indicate that Convolutional Neural Network (CNN) performs better than Support Vector Machine (SVM) and Linear Discriminant Analysis (LDA) techniques in detecting melanoma. This work's result will help improve the accuracy and reliability of CAD systems, ultimately leading to better patient outcomes and higher melanoma survival rates for Kansas and the United States.



**NOTES:**

For more information, please contact:



### Emporia State University

Jerald Spotswood, Emporia State University, Plumb Hall 313, 1 Kellogg Circle, Emporia, KS 66801, (620)341-5508, <http://www.emporia.edu/grad/>



### Fort Hays State University

Angela E. Pool-Funai, Fort Hays State University, 302 Sheridan Hall, Hays, KS 67601, (785) 628-4236, <http://www.fhsu.edu/gradschl/>



### Kansas State University

Claudia Petrescu, Kansas State University, 117 Eisenhower Hall, Manhattan, KS, (785) 532-6191. [www.ksu.edu/grad](http://www.ksu.edu/grad)



### Pittsburg State University

Erik Mayer, S203 Kansas Technology Center, 1701 South Broadway, Pittsburg, KS 66762. <https://www.pittstate.edu/office/grants/>



### University of Kansas

Jennifer A. Roberts, The University of Kansas, 213 Strong Hall, 1450 Jayhawk Blvd., Lawrence, KS 66045-7535, (785) 864-8040. [www.graduate.ku.edu](http://www.graduate.ku.edu)



### University of Kansas Medical Center

Michael J. Werle, The University of Kansas Medical Center, MSN 1040, 3901 Rainbow Blvd, Kansas City, KS 66160, (913) 588-7491. <http://www.kumc.edu/academic-affairs/graduate-studies.html>



### Wichita State University

Coleen Pugh, Wichita State University, 107 Jardine Hall, 1845 Fairmount., Wichita, KS 67260-0004, (316) 978-3095. [www.wichita.edu/gradschool](http://www.wichita.edu/gradschool)

Or visit: <http://www.wichita.edu/cgrs>