Pittsburg State University

2024 Research Colloquium

April 17, 2024

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Schedule of Events

Virtual Presentations
All Day
Online (Prerecorded)
Prerecorded virtual presentations from 2024 are posted online at here.

Oral Presentations
Sunflower Room and Governor's Room, Overman Student Center
8:30 am – 1:30 pm: setup
2:00 am – 4:30pm: presentations

Poster Presentations
2:00 pm - 4:30 pm
Crimson & Gold Ballroom in the Overman Student Center
Presenters will be standing by their posters and giving their 3-minute presentation to judges and others who are interested and answering questions.

Research Categories

Category A primarily Sciences and Technology
Category B primarily Business, Education, and Humanities
Category C Creative Works
Category D Topical Literature Review
Category E High School

Category A: primarily Sciences and Technology
Undergraduate Poster Presentations

Transition Metal-based Electrocatalysts for Water-Splitting Applications

Presenters: Anjali Gupta and Alexandra N. Robinson
Faculty Sponsor: Dr. Ram K. Gupta

Hydrogen is considered as one of the most efficient and green fuels. Hydrogen can be produced via water water-splitting process, however, an efficient electrocatalyst is required to make this process cost-effective. In this work, a transition metal-based electrocatalyst was designed to reduce the overpotential and increase the efficiency of the water-splitting process. The performance of the electrocatalyst is found to be largely dependent on its structure, phase, morphology, electronic environment, and number of active sites. The phase and morphology of iron oxide (Fe_3O_4@Ni-Foam) were tuned by sulfurization and phosphorylation to produce FeS and FeP, respectively. The synthesized electrocatalysts were characterized using structural and electrochemical testing processes. FeS and FeP showed nanoflower and nanoneedles-like morphologies, respectively. During electrochemical studies, FeP was shown to be the most effective electrocatalyst for the oxygen evolution process (OER), the urea oxidation reaction (UOR), and seawater electrolysis. The overpotentials observed for OER, UOR, and seawater splitting were significantly reduced when using FeP as compared to other materials, with values of 207 mV, 133 mV, and 287.1 mV, respectively, at a current density of 10 mA/cm^2. The enhanced catalytic activity of FeP over FeS and Fe_3O_4 could be attributed to morphological changes, improved electronic conductivity, and exceptional endurance. This work suggests that sulfurization and phosphorylation of transition metal oxide/hydroxide can tune the morphology and electrochemical properties and thus can improve the electrocatalytic activity of transition metal-based nanomaterials.

Commodious Coffee Machine

Presenter: Estevan Hernandez
Faculty sponsor: Clark Shaver, P.E.

The commodious coffee machine (CCM) is an automatic coffee machine that streamlines the process of making coffee via sublime convenience. It is designed to yield a net effect of being a customizable, timesaving, practical, dependable, commercial office-space brewing machine. Capabilities include dispensing creamer, sugar, cups, hot water, brewed coffee, and automatic clearing of coffee grounds. Furthermore, it is capable of catering to individual preferences of varying confectionary ratios.
Additional features include a touchscreen, integrated RFID reader, temperature control, brewing production volume control, automatic start, an annunciator system, and low maintenance.

Predicting Aurora Borealis Visibility Combining Satellite and Citizen Science Data with Artificial Intelligence

Presenters: Estevan Hernandez, Jacob Luton, Ty Woolven
Faculty sponsor: Dr. Erik Mayer
Co-authors: Dr. Tao Wu, Butler Community College, Dr. Hongsheng He, University of Alabama, Dr. Elizabeth MacDonald, Goddard Space Flight Center

Our research project embarks on an innovative journey to predict the aurora borealis, or northern lights, by using a unique combination of satellite data and Aurorasaurus, a citizen science platform. The satellites provide crucial information on solar wind and geomagnetic activity while Aurorasaurus gathers public reports and observations of auroras. To predict where and when the auroras can be seen from Earth, our approach includes an advanced artificial intelligence (AI) algorithm known as logic tensor networks which combines neural networks with predicate logic.
This research is funded by the NASA EPSCoR Rapid Response Research grant *Appendix F: A Neural-Symbolic Aurora Model Driven by Aurorasaurus Data in Citizen Science*. The Aurorasaurus site currently uses the Ovation Prime model which uses satellite data to predict the probabilities of viewing the aurora at different locations. However, the Ovation Prime does not completely agree with citizen science reports. This research attempts to supplement the Ovation Prime model with logic tensor networks to produce more accurate predictions.
The current focus is on obtaining code for the Ovation Prime model. Plans are then to combine the probabilities generated by Ovation Prime and the Aurorasaurus sightings with logic tensor networks. The use of an auto-encoder to reduce the dimensionality and noise of the satellite data is also being investigated. In addition, curriculum is being developed to introduce the technique of logic tensor networks to Electronics Engineering Technology classes such as EET 549 Advanced Microcontrollers and EET 745 Advanced Microprocessor Systems and Applications in the Spring 2024 semester.

Effect of Halide in Ammonium Salts in the Addition of Benzoic Acid to Styrene Oxide

Presenters: Annalyse Gilmore, Jeffrey Horinek, Lindsay Pruett, Ryn Sprague, Tristian Stevens, Kelsie Tucker, and Charles J. Neef*

Nucleophilic additions to epoxides are an important class of reactions in organic chemistry which have found use in material science, as intermediates, and in the synthesis of biologically important compounds. Many nucleophiles add to epoxides via a S_N2 mechanism at the least substituted carbon. However, under acidic conditions addition is at the most substituted carbon via a S_N1 mechanism. Included within this class of reactions is the addition of carboxylic acids to epoxides using tetrabutylammonium bromide as the catalyst. These reactions are straight forward and give high yields of the product. However, previous work in our lab using phthalimide as the nucleophile showed a faster reaction rate with tetrabutylammonium fluoride. Due to this result, we were interested in studying the effect of halide on the addition of benzoic acid to styrene oxide. To better understand this reaction and the role of the catalyst, the halide of the ammonium salt was varied (F^-, Cl^-. Br-, and I-). Reaction times were determined by IR spectroscopy and the product ratio was determined using proton NMR spectroscopy. The results, reaction times and ratio of products, of these studies will be reported.

Tick and Tick-Borne Pathogen Surveillance as a Public Health Tool Updating Kansas Geographic Distribution Map

Presenter: Erik Jantz
Faculty Sponsor: Dr. Anuradha Ghosh

Ticks transmit a wide variety of pathogens including viruses, bacteria, protozoa, and helminths to vertebrates. Their life cycle depends on blood meals from various hosts as well as environmental conditions such as the temperature and habitat type. With climatic changes, the expansion of tick habitat creates a need for annual surveillance of ticks and periodic update of geographic distribution maps. The present study conducted tick surveillance using flag-drag technique in both Crawford County and Anderson County, Kansas as well as ticks collected from a veterinary clinic in Crawford Co. during March-August 2023. Locations surveyed in Crawford Co. were a mined land area, recreational park, and a farm. Surveillance in Anderson Co. was conducted in recreational areas. Environmental data (temperature, humidity, etc.) were collected on-site at each visit. Collected ticks were identified in the laboratory using taxonomic keys at the species level and differentiated by sex and life stages. A total of 499 adult and nymph ticks were collected, the majority identified as *Amblyomma americanum* (90.4%, Males-204, Females-173, Nymphs-74) and a significant number identified as *Dermacentor variabilis* (9.6%, Males-25, Females-23). More than one species of *Amblyomma* were identified from the vet clinic. Identified ticks are being pooled and tested for selected bacterial pathogens using real-time PCR. The outcome of this study will help our Kansas State agency in updating the geographic distribution map of ticks in Kansas. Knowledge of pathogens carried by this tick population will assist in management programs and efforts to reduce the risk of tick-borne diseases.

Bowling Ball Spa

Presenters: Patrick McLaughlin & Zach Woods
Faculty sponsor: Clark Shaver

The Ball Spa is a bowling ball cleaner and oil detoxifier. This device is designed to effectively clean the ball's cover stock and remove absorbed oils that accumulate as bowlers use the ball at bowling alleys.

Upon placing the ball into the machine, it initiates a thorough process facilitated by a pulley system. The process begins by moving the ball into the oil detox vat, allowing for efficient detoxification. This detoxification procedure involves immersing the ball in water and gradually heating it to ~115°F for a duration of 10 minutes. Subsequently, the water is drained, and the ball is carefully raised for cleaning and drying. To ensure gentle handling, three rotating linear actuators are employed to release tension from the pulley.

The subsequent stage employs these rotating linear actuators, now equipped with microfiber pads, to delicately polish the ball's surface. This action effectively eliminates accumulated dirt and oils, leaving the ball in a pristine condition. Our device aims to not only enhance the performance of bowling equipment but also extend its lifespan through this comprehensive cleaning and detoxifying process.

A New Life for Pittsburg State University Surplus Plastics Through Recycling

Presenter(s): Joe Murphy, Taygen Bantz, Nicholas Clark, Connor Ramsey
Faculty sponsors: Paul Herring and Jeanne Norton

Recycling polymeric materials has become an area of concern worldwide but may not be as economical as consumers believe. We examined the feasibility of recycling discarded soap dispensers after changes were made in PSU bathrooms campus-wide. First, soap dispensers were deconstructed, cleaned, and granulated to reduce the size of the plastic parts to processable dimensions. To achieve optimal granulation of material from the soap dispensers and aid in the processing of post-consumer regrind (PCR) for other projects, we installed a larger capacity size reduction machine. We then successfully determined the base polymer in each different part through infrared spectroscopy and thermal analysis by differential scanning calorimetry and thermogravimetric analysis. We determined that we had three different plastics in one soap dispenser: polypropylene, polyacetal, and polystyrene. After polymer identification, we injection-molded test bars to produce samples for mechanical property determination. We also performed feasibility calculations to determine if we reduced overhead by using recycled materials. In addition to material cost, we also examined the effect of man-hours and quantity of dispensers to fully determine PCR feasibility. Our calculations determined that small-scale recycling was not optimally feasible even with low-cost starting materials. However, a total of 121 soap dispensers (23.11 ft^3 of waste products) were kept out of landfills, and new plastic parts were successfully made through recycling. We believe that large-scale application of PCR in new parts and improved product design with end-of-life concerns focused on sustainability can improve the feasibility of PCR for consumer products.

Investigation of Visual Data Analysis Skills and the Impact on Clinical Decision Making

Presenters: Halle Panter
Faculty sponsor: Dr. Paige Boydston

Visual inspection of data in behavioral research and practice requires an understanding of varied processes, such as fluency with trend and variability. Determining the appropriate time to modify independent variables based on behavioral responses is imperative during repeated measurement procedures.The primary purpose of the current project is to conduct a preliminary investigation of behavioral practitioner abilities to review data in multiple formats (e.g., raw data, line graphs) and their resultant ability to make appropriate data-based decisions. Data-based decisions may vary, including recommendations to continue or alter an intervention, and their ability to identify at what point in time an intervention should have been modified. The secondary purpose of the current project is to evaluate the potential difference in data-based decision-making skill levels based on training modality (e.g., electronic versus paper training). Methods and procedures for the project include creating, administering, and analyzing an anonymous survey with hypothetical data sets presented in varied formats, with participants required to make a data-based decisions. Participation will have no specific restrictions, but recruitment efforts will target Board Certified Behavior Analysts. The survey will be distributed through multiple platforms including email,

Facebook, and recruitment posters. The survey will include sections such as demographics, an initial 20-30 question "quiz" with varied data and varied data presentations, a short informational section on components of analyzing data, and an additional 20-30 question "quiz." Data will be analyzed in several ways, including scores per participant group, scores based on length of experience, and scores based on training modality.

Manyfishes 1: A Standardized Test of Inhibitory Control in Fishes Using Big Team Science

Presenter: Shane Rance
Faculty sponsor: Laurent Prétôt

Although fish behavior research has a reasonably long history, the past decade has seen a dramatic increase in the number of studies on fish cognition. Yet, there exist important limitations to our assessment of fish cognition that can lead to replicability issues, including the use of small sample sizes, nonrepresentative samples, and unstandardized protocols. Recently, several Big Team Science initiatives have begun to address this problem in various taxa (e.g., ManyBabies, ManyPrimates, ManyBirds, ManyDogs). In the same spirit as its predecessors, ManyFishes uses an approach based on large-scale collaboration across researchers and institutions in an attempt to increase both the number and diversity of fish samples used in cognitive and behavioral research. Here, we tested Lamarck's angelfish (Genicanthus lamarck, N = 7) in a pilot version of ManyFishes 1, the first-ever study of the ManyFishes project that uses a standardized version of the cylinder task—a detour paradigm widely used in comparative psychology—to assess inhibitory control capacities in fishes. In the task, subjects must swim around a clear cylinder to obtain a food reward located inside the cylinder; importantly, to succeed, they must "detour" the obstacle by inhibiting their motor impulses to reach for the food directly, thus avoiding to bump or touch the cylinder walls along the way. We discuss the results of our pilot study, both advantages and challenges of the experimental procedure, and the implication of our findings for the ManyFishes project.

Activated Maple Carbon as a Bio-Based Cathodic Material in Lithium-Sulfur Batteries for Electrochemical Energy Storage Applications

Presenters: Alexandra N. Robinson and Anjali Gupta
Faculty sponsor: Dr. Ram K. Gupta

As the demand for energy increases, researchers are searching for new, clean energy sources to replace fossil fuels. Scientists are also synthesizing and studying new materials to harness this energy efficiently in electrochemical energy storage devices. These devices are currently used in applications ranging from smartphones to electric vehicles. Common electrochemical energy storage devices include batteries, capacitors, and supercapacitors. In this work, the focus is on lithium-sulfur batteries (LSBs). The charge/discharge mechanism in LSBs is significantly more complex than in other types of batteries. It's called the conversion mechanism, because, during discharge, cathodic sulfur reacts with anodic ions to convert the sulfur to sulfide. Sulfide is then converted back to sulfur during charge. The presence of sulfur enables these batteries to have a more complex working principle, thanks to the 16-step redox reactions. Each step increases the

efficiency of the battery. Additionally, LSBs have the theoretical potential to reach an impressive energy density above 500 Wh/kg, but current studies have revealed limitations due to the slow reaction kinetics of the sulfur reduction reaction (SRR) and the shuttle effect, caused by the soluble polysulfide intermediates. To combat these limitations, this work synthesized a replacement material by activating bio-based carbon from maple leaves. This material was then used to make a maple-carbon sulfur composite and placed in coin cells. These batteries were then tested using cyclic voltammetry, electrochemical impedance spectroscopy, galvanostatic charge-discharge measurements, and cyclic stability at different C-ratings. The MC: KOH (1:3) sample showed a high specific capacitance at 0.1 C of 1050mAh/g, good stability, and good C-rating.

Installation of Rocheleau Blow Molder in the Department of Plastics Engineering Technology at PSU

Presenters: Gage Rossetti, Eric Chelgren, Sawyer Patrick, and Jordan Thomas
Faculty sponsors: Paul Herring and Jeanne Norton

Plastic processing is an important step in creating products used in everyday life. With the generous donation of the Rocheleau R-4 blow-molding machine from Chevron-Phillips, we offer PSU students the ability to study blow-molding through hands-on lab activities. The Rocheleau blow molder, an extrusion blow-molding machine, is used to produce hollow plastic products through shaping a molten plastic parison in a specialized mold. Our team installed the Rocheleau R-4 blow-molding machine to resume production of Gorilla water bottles. These bottles are sold for the purposes of fundraising and advertising PSU and ETECH-Plastics. To successfully install the blow molder, we cleaned and prepped the machine, adapted the Gorilla bottle mold to the machine, and made adjustments to machine parameters to achieve desirable Gorilla bottles. Challenges we encountered included the functionality between the programmable logic controller and the human machine interface, and adapting the mold to fit the new machine. Despite these obstacles, we successfully installed the blow-molder. We also modified the mold and head tooling to produce parisons with the proper diameter in order to resume Gorilla bottle production. In service to future PSU Plastics students, we developed a process window and work instructions to allow novices to operate the machine safely and efficiently, as well as produce optimized blow-molded parts. Installation of the Rocheleau R-4 blow-molder will allow the production of the Gorilla Bottles to continue, so that future students and members of the plastic industry will have the opportunity to learn the about blow-molding through hands-on lab activities.

Study of Post-Industrial and Post-Consumer Plastics for Degradation Behavior and Material Properties

Presenters: Emma Springer, Brady Franklin, Zach Coenen, Jacob Shuler, Grant Howard
Faculty sponsor: Jeanne Norton

Plastic pollution is a rapidly growing global problem. Current methods of plastics disposal cause even greater environmental impacts. For example, landfills are at capacity, incinerators are increasing greenhouse gases, and microplastics are polluting woodlands and water ways. Thermoplastics recycling of high-density polyethylene (HDPE) has become a focal point in the plastics industry. In this study, we demonstrated the effects that different processing levels have on

HDPE physical properties. We processed and analyzed six different plastics: “virgin HPDE”, “internal regrind”, “internal regrind pelletized”, “repro”, “repro with additive”, and “flake”. We first processed the material that was donated to us by Rehrig Pacific into test bars using twin-screw extrusion compounding and injection molding. We then tested mechanical properties such as tensile strength, flexural strength, and impact strength, as well as thermal properties via differential scanning calorimetry, thermogravimetric analysis, and melt flow analysis. Thermal analysis showed no substantial difference between the materials analyzed. All materials had similar mechanical properties with the exception of “repro”, which had higher flexural strength, and lower tensile strength and elongation. Melt flow analysis indicated that “internal regrind pelletized” had slightly lower melt viscosity compared to other materials, suggesting that extrusion may have reduced the material’s molecular weight. Additionally, inclusion of an additive to “repro” improved all material properties we studied. We have demonstrated that differences in post-industrial and post-consumer treatment had an effect on physical properties of plastics, and we can process recycled plastics into plastic parts while gaining a better understanding of processing effects on material properties.

Beyond the Fire: Natural Resource Management Techniques at Prairie State Park.

Presenters: Khloey Stringer, Riley Teutsch, Heather Burrow, Alesha Lawson, Gabe Jones
Faculty sponsors: Andrew Braun, Christine Rega-Brodsky, and Andrew George

The tallgrass prairie ecosystem once spanned more than 70 million hectares of what is now the Midwestern United States, including eastern Kansas and western Missouri. Yet, only 4% of the tallgrass prairie remains intact, making it one of the most threatened ecosystems in North America. Two of the most serious threats to the remaining tallgrass prairie are woody encroachment and invasive plant species. Through a new partnership with Prairie State Park, five Pittsburg State University students worked with resource professionals to learn, practice, and apply prairie management techniques. We gained experience in the use of a chainsaw, UTV, ATV, brush cutter, propane torch, and backpack leaf blower for the overall goal of removing invasive red cedar (*Juniperus virginiana*) from the park. We assisted with winter vegetation management, including woody plant control and a prescribed burn. Our efforts created habitat for wildlife and helped to restore portions of the park that had become degraded due to woody encroachment. This new program collaborates with state agencies and will continue to prepare PSU students for careers in natural resource management and prairie restoration.

Great Lunar Expedition for Everyone (GLEE)

Presenter: Konner Vanderford
Faculty sponsor: Erik Mayer

The goal of the Great Lunar Expedition for Everyone (GLEE) is to develop hundreds of tiny LunaSats that will be programmed by college and high school teams and deployed on the Moon. The GLEE teams are currently from 22 countries. The PSU team is the only GLEE team in the state of Kansas.

Cornhole Smartboard

Presenters: Konner Vanderford and Denton Carrico
Faculty sponsor: Clark Shaver

The Cornhole Smart Board is a automatic scoring system for cornhole. Using Ultra-wideband rfid tags it will gather data upon where the bags are located. When a bag is on the board it will count for one point and if it does not make it on the board or falls off no points are given. There will be a color sensor to detect any through hole bags which results in three points. After each round this data will be used to generate a score for the players to see on a LCD display. Each round the points made from both teams will cancel out and the team with points left will be put in for the score. Once the first team scores 21 points the game will be over and the game will reset.

Addition of Phthalimide to Styrene Oxide Using Ammonium Salts as Catalysts

Presenters: Cassie Wheeler and Erin Hammeke
Faculty sponsor: Jody Neef

Nucleophilic additions to epoxides are an important class of reactions in organic chemistry which have found use in material science, as intermediates, and in the synthesis of biologically important compounds. Many nucleophiles add to epoxides via a SN2 mechanism at the least substituted carbon. However, under acidic conditions addition is at the most substituted carbon via a SN1 mechanism. Included within this class of reactions is the addition of carboxylic acids or phenols to epoxides using tetrabutylammonium bromide as the catalyst. These reactions are straight forward and give high yields of the product. In our lab, we are interested in applying these conditions to the addition of phthalimide to epoxides. Using styrene oxide with tetrabutylammonium bromide as the catalyst, the addition of phthalimide proceeded to completion within 16 hours when monitored by IR spectroscopy. However, the proton NMR spectrum showed ca. 1:1 mixture of addition at the least and most substituted carbons. To better understand this reaction and the role of the catalyst, the halide of the ammonium salt was varied (F-, Cl-. Br-, and I-) and the length of the alkyl chain of the ammonium salt was varied (Bu, Pr, Et, and Me). The results, reaction times and ratio of products, of these studies will be reported.

Category A: primarily Sciences and Technology
Graduate Poster Presentations

Effects of Fillers on Polyurethane Properties in Composites Based on Hempseed Oil

Presenter: Mansi Ahir
Faculty sponsor: Dr. Ram K. Gupta

Over the past few decades, polymer composites have received significant interest and become a protagonist due to their enhanced properties and wide range of applications. Herein, we investigated the effect of filler and flame-retardant on the properties of polyurethane foams prepared using hemp seed oil (HSO). Firstly, the HSO was converted into the corresponding epoxy analog with acetic acid and hydrogen peroxide, followed by a ring-opening reaction with methanol to construct hemp bio-polyols which was characterized by FT-IR, hydroxyl, and acid values experiment. Synthesized hemp polyol was reacted with diisocyanate in the presence of commercial polyols and other foaming components to produce rigid polyurethane foams. In addition, different fillers like microcrystalline cellulose (90 μm particle size), alkaline lignin, titanium dioxide, and melamine as a flame-retardant were used in different wt.% ratio to fabricate composite foam. The mechanical characteristics, thermal behavior, apparent density, cellular morphology, flammability, and closed cell content of the generated foams were examined. Initial screening of different fillers reveals that cellulose improves mechanical strength up to 260 kPa at 20% yield strength. The effect of melamine flame-retardant in composite foam was also examined which shows the highest compression strength of 340 kPa and all the composite foam has over 90% of closed cell content. The presence of melamine reduced the flammability of the prepared foams. The foam containing 15 gm of melamine showed a reduced burning time of 4.1 seconds and weight loss of 1.88%.

The Influence of ChatGPT Integration on Indian International Students in the United States

Presenter: Narayan Reddy Baddam
Faculty sponsor: Tatiana Goris

Artificial Intelligence is the ground-breaking modern technology in the market and ChatGPT is one of the best implementations of artificial intelligence, which became available to general public. This study aims to examine the influence of ChatGPT on the academic performance of Indian international students in American higher education. Artificial Intelligence is becoming part of everyone's life, especially students who adapt quickly. ChatGPT is convenient and easy to use and provides convenient and comprised answers depending on their question. This study will be conducted on students of the age group 18 to 24 years, who have used or explored ChatGPT. For this study a total of 10 participants will be taken and interviewed, out of which five are graduate students and five are undergraduate students from Pittsburg State University. This study considers the cultural and socioeconomic backgrounds of Indian international students, which play an important role in shaping their academic experiences in the United States. The results of the study are based on the reviews and experiences of the students, which will be compared and analyzed to draw conclusions. This study will provide knowledge on Indian international students on how

usage of ChatGPT will change their learning methods in a positive and negative way. This study can help schools and technology developers improve their support towards these students, making their time studying abroad easier and more comfortable.

How Leadership Styles Influence Retention of Employees in Indian IT Industry

Presenter: Akshay Buggani
Faculty sponsor: Tatiana Goris

This research investigates how different approaches to leadership styles affect employee retention in the Indian IT industry. The study uses a case study design with qualitative methodology to investigate how various leadership styles affect retention rates. To obtain an understanding of the cultural dynamics and influences present in IT organizations, experienced managers will be interviewed, one mid-level manager and a manager. This research is important because it gives managers useful knowledge about the best leadership practices for retaining staff and enhancing the stability and success of the business. Through conducting interviews with managers and examining actual cases, the goal is to find out what strategies keep workers content and motivated. The study includes that the participants will be aware of its specifics, they will have access to interview questions, they will be able to engage in interviews, they will have prior expertise in the IT field, and will tell the truth while answering questions. being informed about any issues facing the IT sector that might impact our study. This research will guide managers learn different leadership styles which contributes to improving the work environments of Indian IT businesses and attracting long-term employees without retention or leaving company early.

Effect of Flame-Retardants on the Properties of Vegetable Oil-based Polyurethane Foams

Presenters: Janvi Chaudhari and Pratik Patel
Faculty sponsor: Dr. Ram K. Gupta

Polyurethanes (PUs) can be made from a range of starting materials and are used in a variety of practical applications, including foams, coatings, adhesives, and sealants. In general, PUs are synthesized by reacting polyols with isocyanate. Traditional polyols are usually made from petroleum-based sources. The production of bio-based polyols from vegetable oils would reduce dependency on fossil fuels and the environmental effects associated with the mining and consumption of petroleum-based products. PU foams can catch fire due to their porous structure, hence the use of flame retardants is critical. Vegetable oil-based polyol was synthesized using an epoxidation reaction of double bonds followed by ring-opening. A halogen-free flame retardant (DPPMA) using melamine and diphenyl phosphonic acid was synthesized. The three sets of PU foams were created using three different flame retardants in varying quantities: melamine (MA), dimethyl methyl phosphonate (DMMP), and melamine salt (DPPMA). The closed-cell content of MA-containing foam was 90%, whereas DMMP and DPPMA foams showed a declining tendency at larger loadings. The TGA and compression strength tests showed strong thermal stability at high temperatures. All the foams showed good compression strength. During the burning tests, all foams indicate a decrease in weight loss and burning time with an increase in the amount of FRs in the

foams. Among the three FRs, the DMMP showed the shortest burning time and the highest compression strength. Our research suggests that vegetable oil-based polyol could be used as a substitute for petroleum-based polyol, and the addition of MA, DMMP, and DPPMA can significantly reduce the flammability of PU foams.

Chicken Fat-Based Polyurethanes: Effect of Flame Retardants on the Thermomechanical Properties of Polyurethane Foams

Presenter: Nirmalbhai Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

Polyurethane (PU) is one the most used polymers across the globe with a huge variety of applications which include but are not limited to foams, coatings, adhesives, and elastomers. Among all these applications, PU foam is the most dominant in the global market in terms of applications. Rigid and flexible foams are the two types of foams. As thermal insulators, rigid polyurethane foams (RPUFs) find extensive application in buildings, refrigerators, automobiles, and freezers, in addition to furniture and other domestic items. In this research, chicken fat oil was used as an alternative to polyols for the preparation of polyurethane foams. Chicken fat oil was converted into a polyol by epoxidation and ring-opening reactions. The results of FT-IR, GPC, and hydroxyl value confirmed the formation of polyol. Three different flame retardants such as diethyl phosphate (DEP), triethyl phosphate (TEP), and dimethyl methyl phosphonate (DMMP) were introduced to reduce the flammability of PU foams. The closed cell content of all the foams was more than 85% which suggests their suitability to use as thermal barrier applications. The density of these foams was within the industrial standards. The burning test showed a reduction in the foam's flammability after the addition of flame retardants. Thermogravimetric analyses indicated improved thermal stability after the addition of flame retardants. Our research suggests that chicken fat can be used as an alternative to vegetable oil or petrochemical-based chemicals for the preparation of polyurethane foams.

Study of Thermal and Mechanical Properties of Bio-based Foam using Phosphorous and Nitrogen-based Flame Retardants

Presenters: Sujal Chaudhari and Mayankkumar L. Chaudhary
Faculty sponsor: Dr. Ram K. Gupta

Polyurethanes (PUs) are defined as synthetic copolymers prepared using polyols and polyisocyanates. They have a wide range of applications in a variety of products, such as furniture, medical equipment, packaging, foams, coatings, elastomers, and adhesives. Out of all these, one of the most significant commercial products is polyurethane foams (PUFs). However, most of the raw materials used for PUFs production originate from non-renewable sources and due to their highly porous nature, these foams are highly flammable. It is considered essential to combine bio-based components to produce polyurethanes with good flame retardancy. Thus, introducing halogen-free flame retardant is a primary requirement to synthesize PUFs. In this research work, soybean oil (SO) was chemically modified into soybean oil polyol (SOP) through epoxidation and ring-opening reactions. The synthesized chemicals were characterized using FT-IR, GPC, viscosity, and hydroxyl value. Also, three different halogen-free flame retardants (FRs) were

introduced to reduce the flammability of PUFs. Melamine (MA), ODOPM-CYC, and DOPO (9, 10-dihydro-9-oxa-10-phosphaphenanthrene-10-oxide) were used as flame-retardants in this study. Different amounts of FRs were added to the RPUFs to evaluate their effect on PUFs properties. Physical, thermal, morphological, and mechanical properties were evaluated. Results showed a decreasing trend in burning time after the addition of an increasing amount of FRs in PUFs. The lowest flame duration of 5.1 seconds and weight loss of 1.28% were observed for foam containing ODOPM-CYC as FRs.

Castor Oil-based Polyurethane Adhesives: Effect of Cross-Linker on the Bond Strength

Presenters: Mayankkumar L. Chaudhary, Pratik Patel, Rutu Patel
Faculty sponsor: Dr. Ram K. Gupta

Adhesives are important for binding diverse materials, promoting structural integrity and functional versatility in countless daily life applications. An enormous obstacle remains in the development of polyurethane (PU) adhesives exhibiting excellent bonding strength. Designing a chain extender with appropriate molecular structures is critical to improving the bonding strength of polyurethane-based adhesives. In this work, polyurethane-based adhesive was prepared using castor-oil-based polyol and diisocyanate. The bonding strength of the adhesive was improved by adding chain extenders such as N, N-bis (2-hydroxyethyl) thiophene-2, 5-dicarboxamide (ETP) and N, N-Bis (2-hydroxyethyl)-terephthalamide (ETAM). The modified adhesive showed high bonding strength after the addition of chain extenders due to the presence of the di-carboxamide group, which served as a center for hydrogen bonding. The bonding strength of PU adhesive increased to 7.22 and 9.68 MPa from 5.0 MPa after the addition of 7.5 wt. % of ETP and 5.0 wt. % of ETAM, respectively. The bonding strength of the adhesives was tested on both wood (oak) and metal (stainless steel) coupons. The bonding strength of 9.68 MPa on oak wood and 6.73 MPa on stainless steel coupon was observed for the 5.0 wt. % of ETAM-based PU adhesive. The bonding failure was observed to be due to wood failure. The reason behind the good bonding is noncovalent bonds which are formed between the functional group of the PU molecular chain and the surface of the substrate. In addition, no major changes in FT-IR after keeping these adhesives in different solvents were observed. Good crosslinking is also confirmed by studying the gelling and swelling data of the adhesives.

Castor Oil-Based, Environmentally Friendly Using Melamine-Based Flame Retardants for Polyurethane Foam

Presenters: Niyati Chaudhary and Pratik Patel
Faculty sponsor: Ram K. Gupta

Rigid foams, which are mostly used in the construction, refrigeration, and automotive industries, are one of the most important groups of polyurethanes with substantial potential for insulation and energy efficiency. Regrettably, stiff polyurethane foams often catch fire and are entirely combustible. They rapidly spread the flame as well. Rigid foams are considered hazardous materials because of all these potentially life-threatening situations and environmental issues. In response, nitrogen-based compounds have emerged as efficient, affordable, and ecologically

friendly flame-retardant substitutes for halogenated compounds. It has been established that melamine derivatives should be included in stiff polyurethane foams to create nitrogen-based flame retardants. Because it includes melamine and its derivatives, which are also effective at stopping the spread of fire, the rigid foam is more thermally stable. This study found that the renewable resource castor oil (CO) allayed worries about environmental pollution. To improve production efficiency, sustainability, and compressive strength, CO-based multifunctional polyols were used in the synthesis of PU foam, which is widely used as an impact-absorbing material for protective gear. Two types of polyols based on castor oil with varied percentages of hydroxyl were prepared, and the viscosity of the blends was assessed. The physical, mechanical, and thermal properties of melamine (MA), melamine cyanurate (MC), and melamine phosphate (MP) at different concentrations were investigated in bio-based rigid polyurethane foam. In the burning test, the control foam burned for 49 seconds, losing 53.28% of its weight. Weight loss and the time it took for self-extinguishment were decreased by using more flame retardant than ordinary foam. Additionally, compared to foams based on MC, foams based on MA and MP showed a better level of thermal stability. The addition of MP and MA resulted in shorter burning times—9.5 and 14.4 seconds, respectively—and smaller weight losses—9.68% and 7.76%, respectively. When melamine-based flame retardants were added, there was less smoke and a quicker burning rate. It is possible to manufacture a bio-based polyurethane foam that exhibits suitable flame-retardant properties based on melamine, as the study reported here indicates. Thus, it was possible to use nitrogen-based flame retardants and castor oil polyol, two environmentally friendly ingredients, to improve the rigid polyurethane foams' mechanical, thermal, and physical stability.

Biofeedback Assisted Self-Monitoring to Reduce Blood Glucose Levels in Sedentary Adults with Obesity

Presenters: Robert Cordova and Marlon Williams
Faculty sponsors: Dr. Ryan C. Speelman and Dr. Tristan Ragland

The primary purpose is to provide Libre 3 continuous glucose monitors (CGM) to facilitate understanding of blood glucose response to feeding 14 days. It is hypothesized that consistent monitoring via CGM will facilitate participants' correctly identifying foods that spike glucose levels and self-monitoring and feedback will help maintain healthy levels. Participants will discuss/set healthy eating and activity goals. Then a CGM will be inserted on the lower right abdomen of the participants. CGMs give minute-by-minute glucose reading allowing participants to understand how their body responds to different meals over the course of the study. Eating foods containing simple sugars, such as a candy bar, result in a quick and sharp rise (>200 mg/dl) decline (<80 mg/dl) in glucose levels leading to more compulsion to eat simple sugars. Baseline will measure 4 days of glucose with glucose monitoring devises blinded to participants. On days 5 - 11 monitors will be unmasked, at which time participants will receive undated information on their blood glucose every minute to their phone via Bluetooth and blinded again from days 12 – 14. Participants will report their average glucose for each day to the research team, as well as number and average time spent in hyper- >150 mg/dl and hypoglycemic <80 mg/dl events. Improvement could be related to the reinforcing properties of covert private statements such as "I'm healthy" or reducing statements such as "This is not healthy." Monitoring glucose and reporting the results daily to a treatment team (self-monitoring) inherently allows for comparison with recommended guidelines.

Impact of Coding Proficiency on Starting Annual Salaries After Graduation

Presenter: Tejasri Dodda
Faculty sponsor: Tatiana Goris

As many companies are going digital in their operations and many startups are driven by software solutions instead of focusing on physical infrastructure, the demand for coding jobs has increased across the globe as it is the programming that drives computer systems. From transport and food to healthcare everything became Information Technology dependent. We can also observe that there is a wide popularity for programming courses, as the coding skills from those courses might fetch high paying jobs. Students who are pursuing their masters in information technology must be good in coding as it will get them a high paying job after graduation. Nowadays many graduate international IT major students are looking for a job in the software industry, which would bring them a high salaried job. Whereas the jobs in the software industries require a candidate with good programming skills, who will play a major role in the growth and development of their company. This study will determine the impact of coding proficiency of IT major international graduate students at Pittsburg State University, as measured by students Grade in GRT-713 (Computer Programming Languages) on their starting annual salaries after their graduation when they enter the job market. Graduate International Information Technology major students who studied at PSU and have recently entered the job market are included in this study with a sample size of 100 students. In this study, a correlational design is used to establish the relationship between grades in GRT-713 and starting annual salaries.

Exploring the Impact of Generative AI on Higher Education of Indian International Master's Students

Presenter: Lalitha Priya Gayam
Faculty sponsor: Tatiana Goris

This study explores the impact of generative AI tools on higher education of Indian international master's students. The goal of the research is to investigate how the use of generative AI tools affects the academic performance and skill development of the Indian International Master's students by using ethnographic qualitative approach, conducting interviews with fifteen participants across distinct majors and academic years. This research is significant because it helps to understand how Indian international master's students who use generative AI tools perform academically and develop new skills. This study provides insights for integration of technology into education, enabling educators, policymakers, and educational institutions to optimize technology use and promote successful learning practices. This study provides relevant aspects for making decisions in the context of current discussions about the integration of AI in education.
This research is built on considering assumptions, such as participants representation of the larger community of Indian international master's students, the homogeneity of experiences despite major and academic year differences, and truthful responses throughout the interview process. The study also acknowledges its limitations, including the dynamic nature of technical improvements and the possibility of interpretive biases in subjective opinions acquired during interview. Despite these limitations, the study provides insightful information about how generative AI tools affect Indian international master's students' experiences in higher education. This study contributes to current

discussions regarding the effective integration of emerging technologies in academic contexts by offering a comprehensive perspective of technology's impact on education.

Impact of Demonetization on Digital Payment Adoption in Rural Area

Presenter: Pavan Kalyan Gunda
Faculty sponsor: Tatiana Goris

This research took a gander at the effects of demonetization on the adoption and usage of digital payment methods in Vasalamarri, a place in Telangana, India. Demonetization? The thing that was put into action in November 2016. It was meant to restrain black money, corruption, and counterfeit currency by rendering high-denomination currency notes invalid. However, its effect on how rural communities had taken up digital payments—well, that's a subject that still required more investigation! Through these conversations, this research aims to reveal some wisdom about how effective demonetization has been in encouraging digital financial inclusion and what it might imply for the economies and means of existence in rural areas. The findings from this investigation, right, will add their bit to the existing writings on demonetization and digital payments. This, it should be known, is bound to provide some valuable understanding for people who make policies, companies, and people with an interest in this matter. They would be looking to encourage financial inclusion and empower people living in rural areas!

Development of Circularity-focused Plastics Laboratory Activities at Pittsburg State University

Presenters: Grant Howard, Emma Springer, Megan Walser, Paul Herring, and Dan Spielbusch
Faculty sponsor: Jeanne Norton

Modern plastics manufacturing by traditional methods can create a significant amount of waste plastic including sprues, runners, flash, trim, and out-of-spec parts. Transforming waste products into useful parts can significantly reduce the carbon footprint of the plastic industry. Plastics Engineering Technology laboratory activities at PSU generate copious amounts of waste plastic due to required hands-on coursework. This investigation focused specifically on reprocessing ABS waste material from thermoformed scoops generated in Part and Mold Design I. Our objective was to prove the viability of a circular process for ABS waste material by grinding the scrap, injection molding test coupons, extruding new sheets, and thermoforming new parts. This circularity-focused activity will be reproduced within PET processing labs to demonstrate the potential second life for waste material. To demonstrate the quality of reprocessed material, waste ABS was injection-molded into flexural and tensile test coupons to determine mechanical properties. Melt flow testing demonstrated changes in melt rheology. When compared to control ABS, we determined that there was a slight reduction in tensile and impact properties. We do not anticipate that the mechanical property reduction will negatively impact part performance. Subsequently, ABS sheets of varied thicknesses were extruded from ground waste ABS and thermoformed into new thermoformed parts. This lab exercise will demonstrate the ability of incorporating circularity concepts for plastics to reduce the amount of plastic waste generated in

our lab activities as well as proving the viability of improved sustainability in manufactured plastic parts when PET students become members of the plastics industry.

Hemp Seed Oil Polyol-based Flame-Retardant Rigid Polyurethane Foams

Presenter: Sagar Jariwala
Faculty Sponsor: Dr. Ram K. Gupta

In today's world, the idea is to synthesize bio-based polyurethane goods, which reduces reliance on petroleum-based products. As a result, we produced polyol from hemp seed oil (HSO) and evaluated it using FTIR, hydroxyl value, and acid value. Polyol is successfully synthesized and combined with additional ingredients such as catalysts, blowing agents, hardeners, and flame-retardant chemicals to produce stiff polyurethane foams. The focus of this research was to synthesize high-quality flame-retardant rigid polyurethane foams (RPUF) through the addition of flame retardants. Within this line, the majority of the RPUF presented a closed-cell content greater than 65%. Also, a considerable improvement in flame retardancy was observed as the neat HSO-based RPUF had a burning time of 110 seconds and a weight loss of 82%. Yet, the addition of 10 wt% of triethyl phosphate (TEP) reduced to 19 seconds and 5%, respectively. The addition of other two flame retardants, dimethyl methyl phosphate (DMMP) and expandable graphite (EG), also showed similar trends with flame retardancy and mechanical properties. As a result, our research on the manufacture of biobased RPUFs was successful.

Impacts Influence Gen Z's Interest in Starting Entrepreneurship and Startups in Pittsburg, Kansas

Presenter: Mounika Kadiyala
Faculty sponsor: Tatiana Goris

In a rapid evolving landscape of startups and entrepreneurship, how generation Z is acting as a forefront transformation and dynamic force in creating an entrepreneurial ecosystem. The main research study investigates the multifaceted influences shaping Gen Z's interest in startups and the challenges facing entrepreneurs in Pittsburg, Kansas.
The study is approached through qualitative research method by collecting the data through interviews and the population considered for the study is Gen-Z born between 1997 and 2012, are actively engaged in entrepreneurial aspirations. The sample size will be of total 12 students with a diversified field of interest at Pittsburg state university, Kansas. In this digital era of transformation, how Gen Z seamlessly integrating technology, social media, and online e-commerce platforms to launch their startups and promote their business to reach the larger audience. In establishing startups and pursuing entrepreneurship, entrepreneurs aged 20 to 27 are thriving to produce unique business models in creating the promising employment in the market by valuing different network opportunities.
The result of the research will be helpful in preparing the next generation of entrepreneurs, as the study is completely based on student entrepreneur experiences. This plays a vital role in identifying the Generation-Z purpose of innovative start-up as a leading example. The main aim of the research is to determine the targeted generation group of interests and their driving forces in

generating a meaningful impact in the startup culture. Despite, financial uncertainties, this research witnesses the Gen-Z passion towards startup and embracing failure as a steppingstone in becoming a successful entrepreneur.

English Proficiency and Cultural Adaptivity among International Female Students in the US Job Market

Presenter: Swapnika Kolan
Faculty sponsor: Tatiana Goris

The abstract presents a study conducted in 2021 at Pittsburg State University aiming to investigate the English proficiency and cultural adaptivity of female international students seeking employment in the USA. Employing a non-experimental quantitative methodology with a descriptive design, the research focuses on 50 female international students from Pitt State who are actively searching for employment. The study contains 20 survey questions to assess the participants English proficiency and cultural awareness. The main objective is to establish the relationship between English proficiency and cultural adaptivity among female international students in pursuit of employment opportunities. By analyzing the survey data, the study aims to provide insights into whether English proficiency impacts the ability of female international students to adapt to cultural changes in their job search. Notably, the research does not involve grading participants based on their English proficiency assessment results. The findings of this study can contribute valuable insights to academic institutions, employers, and policymakers involved in supporting the integration and success of female international students in the US employment market.

Improved Nickel Hydroxide Efficiency for Overall Water Splitting via Unique Synthesis Methodology

Presenters: Niharika Maley and Pratik Patel
Faculty sponsor: Ram K. Gupta

Water splitting signifies a breakthrough in the realm of renewable energy, facilitating the production of hydrogen (H_2) and oxygen (O_2). In this process, the Oxygen evolution reaction (OER) plays a vital role in the process of energy production, which exhibits higher overpotential than the Hydrogen evolution reaction (HER). Therefore, it necessitates the advancement of electrocatalysts that are more active, durable, and stable. Transition metal oxides and hydroxides are promising materials for water splitting, in which Nickel hydroxide ($Ni(OH)^2$) acts as an essential catalyst in electrochemical water splitting for both HER and OER. Herein, $Ni(OH)_2$ samples were prepared via three different methods which are aerogel, hydrothermal, and microwave respectively, and those materials were tested by using 1M KOH as an electrolyzer in an electrode system. Where the results were evaluated for both HER and OER at the current density of 10 mA/cm2, OER overpotential for aerogel shows 266mV, which was comparatively lower than hydrothermal 311mV and microwave 321mV. Similarly, for HER, ($Ni(OH)_2$) aerogel at the same current density shows 224 mV of overpotential, indicating superior performance compared to hydrothermal and microwave methods. Electrochemical impedance spectroscopy (EIS) revealed excellent results for all samples, indicating favorable charge transfer kinetics. Additionally,

analysis of the electrochemical surface area, roughness factor, and turn-on frequency showed that aerogel-synthesized nickel hydroxide exhibited superior properties, further enhancing its water-splitting performance. These findings underscore the importance of synthesis method selection in optimizing the water-splitting performance of nickel hydroxide materials for sustainable energy applications.

Comparing the Effects of Two Discrete Trial-Training Techniques on Direct Service Provider Productivity

Presenter: MacKenzie Manuel
Faculty sponsor: Dr. Paige Boydston

The purpose of the study is to compare two discrete trial training methods on service provider instructional intensity, as well as the effect of instructional intensity on skill acquisition in children diagnosed with autism spectrum disorder (ASD). Early intensive behavioral intervention (EIBI) is one way to intervene on social deficits, skill detriments, and problematic behaviors of children diagnosed with ASD. Effective EIBI includes fast-paced instruction, 35-40 average treatment hours a week, and an early start age. Outcomes include fine and gross motor skill acquisition, typical education classroom placement, increased language, and decreased problematic behaviors. One method of EIBI with very little research is the verbal card sort. The current study is examining the effect of verbal card sort on instructional intensity and skill acquisition. Four service providers and four children between the ages of 3 and 6 with an ASD diagnosis were recruited from an autism clinic and placed into dyads. The design is multiple baseline across subjects. During baseline, the child's typical intervention will continue. One dyad will then move into intervention, where the card sort method will be put in place. Dyad two, dyad three, and dyad four will join intervention in a staggered fashion. Rate of instructions per hour and cumulative mastered targets are calculated across baseline, intervention, and follow-up.

A Replication of a Preliminary Analysis of Mastery Criterion Level: Effects on Response Maintenance

Presenter: Sydney McFall
Faculty sponsor: Dr. Paige Boydston

Autism Spectrum Disorder (ASD) is characterized as having at least two deficits in areas of functioning such as impaired language development, impaired social development, and the presence of excessive or stereotyped repetitive behaviors or interests (Granpeesheh et. al., 2009). Early and intensive behavioral intervention (EIBI) is an evidence-based practice for remediating deficits in individuals with ASD (Love et. al., 2008). One important component of intensive intervention is defining the mastery criterion, or the point at which a skill has been learned to a sufficient level that allows for maintenance. Mastery criterion is necessary to progress intervention targets on a rapid and consistent basis. Despite the importance of mastery criterion, there is very little research on the ideal criterion to use, or which mastery level leads to the quickest acquisition and most durable results. The present study will focus on the acquisition rate during mastery criterion levels of 50%, 80%, 90% and 100%, as well as the resultant maintenance of skill/target acquisition at four post-mastery intervals (e.g., three weeks following mastery of the skill/target).

Three to five children with ASD between 3-6 years of age will be recruited. A multiple baseline across participants design will be used to monitor both skill acquisition and maintenance. Four sets of arbitrary stimuli across four skill categories (i.e., receptive labeling, expressive labeling, intraverbals, and matching to sample) will be randomly assigned to mastery criterion levels during teaching procedures for participants.
IRB approval will be obtained prior to initiating data collection for this project.

The Role of Computer-Based Education in the Academic Achievement of Public High School Students (6th, 7th, 8th, 9th And 10th Grades) in India

Presenter: Surya Vinodh Moraboina
Faculty sponsor: Tatiana Goris

With increasing technology innovations, the world is moving towards digitalization. These advancements in technology caused changes in the global education system. The most significant change was the transition in teaching methods from oral to computer based. Computer-based education creates interest among students about a particular topic and students can understand visuals better than reading textbooks or listening to an oral lecture. Countries such as India have both public and private schools. However, in India, just a few public schools implemented computer-based education. Thus, students in public schools may have poor computer abilities, remain uninterested in academics, lack fundamental concepts, and so on. Also, computer skills are essential for higher education and employment. Computer simulations, for example, will help students understand courses like physics and biology. Knowing the importance of computer-based education and its impact on academic achievement, every public school in India can implement computer-based education.
The purpose of this research study is to find the impact of computer-based education on the academic achievement of public high school students (from 6th, 7th, 8th, 9th, and 10th grades) in India. Computer-based education is measured by the number of computer laboratories available in a school that are allowed for students' practice. Academic achievement of public high school students is measured by the grade obtained in the final examination. This study employs quantitative methodology and correlational design. The study's participants include 120 students at a public school in India who are in the 6th, 7th, 8th, 9th, and 10th grades. These students will voluntarily report their final exam grades.

Low Socioeconomic Status Negatively Impacts Field-Test Battery in College Aged Women

Presenter: Adam Mortensen
Faculty sponsor: Dr. Tristan Ragland

Low socioeconomic status (SES) has been shown to increase risk factors of health disparities. Likewise, field tests are often used as a practical way to determine disease risk. PURPOSE: To investigate the influence of SES on cardiovascular health and physical fitness among female D2 university students. METHODS: 249 college-aged women were recruited and split into six groups based on their parents' reported income. The six SES groups are as follows: Group 1 (n=27, $20-

$32K); Group 2 (n=45, $32K-$60K); Group 3 (n=63, $60K-$100K); Group 4 (n=51, $100K-$150K); Group 5 (n=26, $150K-$250K); Group 6 (n=8, $250K+). A battery of field tests was conducted, including weight-height ratio (WtHR), blood pressure (BP), body fat percentage (BF%), waist-to-hip ratio (WtoH), handgrip strength (HG), push-ups (PU), sit-ups (SU), body mass index (BMI), heart rate recovery (HRR), and fitness capacity (VO2max). RESULTS: Compared to all SES groups, women in the lowest SES group had higher WtHR ($P<0.06$), BF% ($P<0.03$), BMI ($P<0.004$), but lower VO2max ($P<0.04$). Lowest SES also showed lower PU to mid-SES groups ($P=0.04$), SU ($P=0.03$), as well as higher HRR compared to mid- and high-SES ($P<0.04$). However, there was no difference in BP, WtoH, or HG between groups ($P>0.05$). CONCLUSION: College aged women in the lowest SES group exhibited worse health outcomes compared to those of higher SES. Thus, low familial SES seems to negatively affect health outcomes in college aged women. Further investigation on how to overcome SES health disparities is warranted.

Biobased Vitrimers via Melt-Polycondensation Process with Good Extensibility, Reprocessability, and Self-Healable Properties

Presenter: Saiprasanna Neerukonda
Faculty sponsor: Dr. Ram K. Gupta

The global sustainable development of the polymer industry is dependent upon the ease of synthesis and the replacement of petroleum-based elastomers with biobased equivalents. Here, we suggest the condensation polymerization of aliphatic diacids such as glutaric acid, pimelic acid, azelaic acid, and 1,4-butanediol with a catalytic amount of glycerol as a curing agent and dithiodicarboxylic acid as the dynamic covalent crosslinker to fabricate highly stretchable elastomers. The elastomers showed good extensibility, reprocessability, and self-healable properties. The molecular characterization and thermo-mechanical properties of the elastomer were investigated using Fourier Transform Infrared Spectroscopy, Differential Scanning Calorimetry, and Dynamic Mechanical Analysis. The self-healing performance of the elastomers is ascertained by SEM analysis, where the presence of -S-S crosslinker provides a disulfide metathesis phenomenon which assisted in self-healing properties of the elastomer at low temperatures. The high elongation, thermal reprocessability, and self-healing nature of the polymers result in the successful preparation of biobased vitrimeric elastomer. The simplicity of preparing the elastomers by polycondensation process suggests that there are promising possibilities to generate environmentally friendly sustainable polymers with stimuli-responsive properties.

Influence of Smart Traveler Companion Android Application on Tourist preferences in India

Presenter: Laxmi Tirumala Padugupadu
Faculty sponsor: Tatiana Goris

Although most people like to travel, it might take hours, weeks, or even months to organize a trip in order to discover the right place to visit at the right time. An itinerary would be chosen, preferences would be chosen, the amount of time to spend at each location would be estimated,

routes would be determined by connecting with maps and determining the most convenient routes, etc., all within a particular time range. In order to get the most satisfied out of the travels, tourists and travelers today waste a lot of time organizing and selecting their destinations. This Android application enables tourists to create customized or general travel itineraries. Based on his or her tastes, it offers a trip schedule that includes restaurants, tourism attractions, and lodging. It makes recommendations for locations and neighborhoods based on what the tourists like. Along with popular tourist destinations, tourists may discover neighboring options for lodging, dining options, etc. By offering tourists the optimized travel itinerary based on their interests and preferences, the Smart Traveler Companion application saves the time and facilitates a simple and satisfied travel experience. This Android application follows the phenomenological research method. Participants can be travel agents and end users. The importance of the study is to see if the application allows the user to be more efficient in the travel planning. The Application also provides destination suggestions and application is user-centric. The research is conducted with the aim of determining desires of the tourists in India and the application is only used by Android users.

Bio-Adhesives: Effect of Diamine's Chain Length

Presenter: Uday Panchal
Faculty sponsor: Dr. Ram K. Gupta

The production of ecologically friendly items from renewable feedstock is essential to lessening the demand for non-renewable resources like petroleum-based products. High-performance polymers are formed in large part by plant oils. Still, adjustments are necessary for improved performance. Making polymers from renewable and environmentally friendly materials such as epoxidized plant oils (EPOs) is one way to attain sustainable development in the materials industry. To improve the qualities of EPO-based polymers, crosslinking agents comprising large concentrations of functional groups can be employed in polymers. In this work, highly branching and flexible polyamine was crosslinked with epoxidized soybean oil (ESO) using ring-opening and amidation polymerizations, yielding a unique resin with novel characteristics and a wide range of potential applications. ESO was used in this work to create a matching polymer through a deamination reaction with aliphatic amines like ethylene, butane, and pentane diamine at 195 °C while ammonium chloride was present as a catalyst. Solvent-free procedures that don't need purification or premodifications are among their benefits. This was an easy-to-use and environmentally friendly method. With a steel metal bonding strength of 1996 kPa, MPD-ESO remained the strongest structural adhesive among the synthetic resins even after curing. Steel is always superior, no matter what the temperature. According to strength measurements using MED-ESO resin, steel has a lap shear strength of roughly 300 kPa at 100°C, which is significantly higher than that of copper and aluminium. This figure rises by an additional 750 kPa at 180°C. At 180 °C, the shear strength of MPD-ESO resin is 1996 kPa, whereas that of MBD-ESO resin is only 1220 kPa. The goal of this investigation on increasing chain length was to ascertain how the resin's mechanical and thermal properties changed. TGA verifies that as chain length increases, T_5%, T_{10}%, and T_{max} temperatures rise as well. As we proceed from ethylene diamines to pentane diamines, steel bonding strength likewise rises.

Soybean Oil-based Adhesives: Effect of Aliphatic Diols on the Properties of Adhesives

Presenters: Sonu Parekh, Mayank Kumar L. Chaudhary, Rutu Patel, and Pratik Patel
Faculty sponsor: Dr. Ram K. Gupta

The development of low-cost bio-based formaldehyde-free adhesives has aroused widespread interest in the wood adhesive industry. The usage of adhesives that contain urea-formaldehyde or phenol formaldehyde leads to environmental issues. Therefore, bio-based renewable resources are a better option to use as bio-based polyols instead of petroleum-based polyols. Among all renewable resources, plant oils are the most popular biobased resource for replacing such conventional polyols. Here, in this research work, soybean oil polyol (SOP) was used to synthesize polyurethane (PU) adhesive. For studying adhesion strength, three different aliphatic diols (EDO, BDO, and HDO) with increasing chain length were used as crosslinking reagents. For studying mechanical strength, different wt.% of diols were used to synthesize PU adhesives. The dry lap shear strength of these PU adhesives was observed on two different coupons (oak wood and stainless steel). Interestingly, on oak wood, the mechanical strength was increased from 3 MPa to 6.36 MPa after incorporating BDO which is the highest tensile strength among all the other adhesive samples. Thermal properties were studied by TGA and DSC. A solubility test was also done to check the solvent's effect on these PU adhesives and no major changes were observed in water thus indicating the hydrophobic nature of adhesive samples. After being immersed in different solvents for 24 hours, there were no notable modifications observed in the FT-IR spectra of these PU materials. This work provides a sustainable alternative to petroleum-based adhesives with good mechanical and physical properties.

Bio-based Polyurethane Films: Effect of Hydroxyl Numbers on the Properties of the Polyurethane Films

Presenter: Fenilkumar Patel
Faculty sponsor: Dr. Ram K. Gupta

Polyurethanes have become ubiquitous in our surroundings, but their traditional production relies on fossil fuels, posing challenges due to resource limitations and material toxicity. To address this issue, I propose utilizing bio-based materials such as Limonene, derived from orange peels. Geraniol which is derived from rose and soybean polyol. This research aims to synthesize thiol through thio-ene click chemistry, involving the reaction of limonene with mercaptoethanol and thioglycerol, and reaction of geraniol with mercaptoethanol to produce thiols. The primary goal is to investigate the mechanical properties of polyurethane films as the number of hydroxyl groups increases. The structural morphology will be analyzed using Fourier Transform Infrared Spectroscopy (FTIR), while mechanical properties will be assessed through tensile and hardness tests.

Biobased Linear Polyester: Effect of Acids and Diols

Presenter: Jainishkumar Patel
Faculty sponsor: Dr. Ram K. Gupta

Polyester synthetics are widely used in clothing, but creating environmentally friendly materials from renewable resources is essential to reduce our reliance on non-renewable resources such as petroleum products. Azelaic acid, pimelic, and glutaric acid are natural dicarboxylic acids that can be used for the synthesis of bio-based polyesters. This research focuses on synthesizing saturated linear polyesters using azelaic acid, pimelic acid, and glutaric acid with diols of different carbon chain lengths. The process consists of a two-step polymerization process, which uses stannous octoate as a catalyst and hydroquinone as a radical inhibitor. Optimization of the polymerization conditions, including the catalyst amount, second-stage reaction temperature, and time, to achieve a high molecular mass in the longer chain was performed. 1H NMR was used to analyze the chemical structures of the obtained polyesters. Differential scanning calorimetry (DSC) was used to explore their physical properties, including the effect of dicarboxylate chain length and long-short diol on crystalline structure and thermo-mechanical properties. Increasing the dicarboxylic acid chain length, except for glutaric acid, increased the melting point. The glutaric acid–butane diol film was the most flexible compared to the other polyesters, reflecting good load capacity even after remolding. Overall, this research shows that it is possible to synthesize polyesters with good thermomechanical properties and film flexibility using renewable and environmentally friendly materials. These materials show promise for practical applications.

Waste and New Canola Oils for Flame-Retardant Polyurethane Foams: A Comparative Study

Presenters: Janu Patel and Pratik Patel
Faculty sponsor: Dr. Ram K. Gupta

Waste cooking oil (WCO), obtained from cooking or frying food, poses a serious environmental risk when disposed of inappropriately. Therefore, finding ways to repurpose WCO into valuable products is important to mitigate environmental impact and health risks. This work focuses on utilizing used canola oil (UCO) to produce rigid polyurethane foams (RPUFs) as a sustainable approach to waste management and resource utilization. An epoxidation and ring-opening of UCO was employed to produce UCO-polyol for synthesizing RPUFs. Qualitative experiments such as epoxy, iodine, Fourier transform infrared (FTIR), and hydroxyl studies were carried out to evaluate the quality of UCO and UCO-based polyol, which were compared with new canola oil (NCO)-based polyol. Flame retardancy was improved by incorporating two flame retardants: dimethyl methyl phosphonate (DMMP) and expandable graphite (EG). The burning time of DMMP-contained foam was reduced from 54.95 s to 8.3 seconds, with weight loss from 55.25% to 12.10%. EG-treated foam also showed improvements in flame retardancy, with burning time reduced to 16.5 seconds and weight loss to 5.86%. The closed-cell content, an important factor for foam insulation applications, was around 90% of all the foams. Overall, the research demonstrates the feasibility and benefits of repurposing waste cooking oil to produce polyurethane foams, highlighting its potential for addressing environmental concerns and creating value from waste materials.

Soybean-based Non-Isocyanate Polyurethane Adhesive to Improve Bonding Strength in Wet and Dry Medium: Solvent and Catalyst-Free Approach

Presenters: Pratik Patel, Rutu Patel, and Mayankkumar L. Chaudhary
Faculty sponsor: Dr. Ram K. Gupta

Non-isocyanate polyurethane (NIPU) based on carbonated soybean oil is positioned as an extremely favorable alternative to replace conventional polyurethane, which is toxic to humans and the environment. Specifically, in a humid environment and underwater adhesive strength is compromised because of interference of water molecules to the adhesive materials. It is necessary to improve wet and dry bonding strength because of their widespread applications. In this work, a green adhesive was synthesized from soybean oil and tested in both dry and wet environments. Firstly, soybean oil was functionalized through the epoxidation and carbonation process then three different diamines with varying chain lengths were introduced, which are 1,2-ethylenediamine (EDA), 1,4-butylenediamine (BDA), and 1,6-hexamethylenediamine (HDA) in a solvent and catalyst-free approach for preparing NIPU adhesive. Herein, the effect of the diamine chain on the swelling percentage, adhesion strength, and thermal properties of the adhesives were explored. The dry lap shear strength of the adhesives prepared using EDA, BDA, and HDA showed a bonding strength of 6.23, 8.26, and 7.22 MPa, respectively. Interestingly, the wet lap shear strength of HDA-based NIPU adhesive was observed around 7.49 MPa while it was 5.8 MPa for BDA and 2.8 MPa for EDA. The increasing chain length of diamines exhibits a decreasing trend in swelling percentage in different solvents, suggesting stronger crosslinking of NIPU adhesives. However, HDA has lower tensile strength than BDA due to its brittle nature. The high bonding strength of soybean oil-based adhesives suggests that these green adhesives could be used to produce high-quality interior-grade plywood and bond metal substrates.

Fluorine-Free, Bio-based Antismudge Polyurethane Coating with Enhanced Flame Retardancy

Presenters: Rutu Patel, Pratik Patel, and Mayankkumar L. Chaudhary
Faculty sponsor: Dr. Ram K. Gupta

Traditional methods for synthesizing coating materials often involve the use of fluorinated reagents, which are not only costly but also hazardous, limiting their use in the 21st century where environmental concerns are paramount. As a result, researchers are increasingly turning to bio-based materials for synthesizing polyurethane (PU) coatings. This study focused on developing an eco-friendly polymer coating to protect wood and metal surfaces. The researchers synthesized the coating by reacting a silicone-containing diol with soybean oil polyol (SOP), aiming to leverage the chemical inertness, resistance to various chemicals, and non-stick properties of silicone to achieve the desired properties of an antismudge coating. The coated coupons, made of stainless steel and oak wood, were tested for resistance to solvents and ink. The coated metal coupon was also subjected to water and solvent drops more than 50 times without any noticeable effect. Additionally, the coating demonstrated excellent durability, with contracted ink being erased by a paper napkin after being written on 1000 times. A burning test revealed that the ignition time increased proportionally with the proportion of Si-containing diol, with the Si-40wt.% sample taking more than twice as long as the control sample to start burning (11 seconds). The weight loss

achieved with the Si-40wt.% PU coating material was only 1%. After being immersed in water for 24 hours, these PU coating materials showed no discernible impact, demonstrating their water resistance with a water contact angle of 95°, indicating their hydrophobic nature. Overall, these environmentally friendly materials show promise as candidates for future surface protective coatings.

Modified Limonene and Geraniol Via Thiolene Processes Under UV Curing to Obtain Polyurethane Films

Presenter: Sauravkumar Patel
Faculty sponsor: Dr. Ram Gupta

Natural product-derived materials have gained increasing attention as promising alternatives to petrochemically derived commodity polymers. This shift is driven by the growing awareness of environmental issues and the need for more sustainable and eco-friendly materials. The thiol−ene click reaction to prepare biobased polyols is a strategy to promote the green and environmental protection of polyurethane. Limonene is found in the essential oils of various citrus fruits, particularly in high concentrations in the peels of oranges, lemons, limes, and grapefruits. And geraniol is found in rose oil, citronella oil, and palmarosa oil. The excessive usage of thiol and low conversion of carbon−carbon double bonds (C=C) would severely limit the properties of polyurethane (PU). In this work, a set of limonene and geraniol-based polyols were prepared via the thiol−ene click reaction. I use mercaptoethanol and thioglycerol to produce thiols. Interestingly, the conversion of the C=C was nearly 100% at the limonene and various thiol compounds(-SH) in a stoichiometric ratio without excess of -SH. Then, the prepared polyols were reacted with Cyclohexyl isocyanate (CHDI) and Isophorone diisocyanate (IPDI), Followed by films was cured at 70°C. The structural morphology will be analyzed using Fourier Transform Infrared Spectroscopy (FTIR), while mechanical properties will be assessed through tensile and hardness tests. Thermal characteristics will be studied using thermogravimetric analysis (TGA) and Differential Scanning Calorimetry (DSC). The Tg's of LM+IPDI, LM+CHDI, GM+IPDI and GM+CHDI were 34.58, 56.49, 75 and 56.49 °C, respectively. The GM+SB+IPDI demonstrated better mechanical properties (Tensile Strength of 18 MPa) than the others due to the higher cross-linking density and complete network.

Farmers Adoption of Precision Farming in Agriculture

Presenter: Ashokreddy Pathakota
Faculty sponsor: Dr. Tatiana Goris

To give detailed study about how farmers adopt precision farming in agriculture to get the revenue more profitable with using modern technology to grow crops in the organic manner. Farmers can improve crop yields and assist decisions about the correct selection of crop based on the soil, pesticides, and irrigation process. In this study farmers with 20 or more acres of land taken to complete the survey because precision farming can be done successfully in more acres of land. Precision farming can reduce reduction of the use of more inputs to the yields and labor thus reduce costs and can also make the efficiency in the use of water and the quality of the product can be increased. Precision farming can be used with GPS technology to automatic use of the machines in the field. The main goal of precision farming is to define a decision-making system for whole

farm management with optimizing returns on inputs while using resources. Precision agriculture can use tools such as tractors, combines, sprayers and planters. To collect the data, I'm using the Pearson correlation coefficient using R and scatter plots using Excel to show the graph of the crop yields in the last 5 years with increased in revenue.

Biobased High-Molecular-Weight Polyester with Impressive Elasticity, Thermo-Mechanical Properties, and Enzymatic Biodegradability: Replacing Petro-based PBAT

Presenter: Lav Sharma
Faculty sponsor: Dr. Ram K. Gupta

The widespread utilization of petroleum-based plastics causes environmental issues, prompting the production of biobased high-performance polymers for a sustainable future. With the application of multiple biobased monomers with comparable chemical structures in recent years, efforts are to made to explore or synthesize alternative polymers that has the advantages of plastic. In this study, we have synthesized poly (alkylene furanoate-co-sebacate) by two-stage melt polycondensation, utilizing biomass-derived substituent dimethyl furan 2,5-carboxylate and dimethyl sebacate, and different diols such as butane diol and pentane diol. The synthesized high-molecular weight aliphatic-aromatic polyesters, poly (butylene furanoate-co-sebacate) (PBFS) and poly (pentylene furanoate-co-sebacate) (PPeFS), were characterized by gel-permeation chromatography, FT-IR and NMR spectroscopies. The glycol chain length played a key role in determining the molecular weight, and physical properties of the polymer. The biobased polyester was successfully processed to thin films by compression molding and characterized for thermal, mechanical and enzymatic degradation properties. From the point of mechanical performance and enzymatic degradation, PBFS and PPeFS exhibited impressive elasticity upon stretching, which can be comparable to commercial PBAT. Moreover, chain extension reaction was also performed using intermediate polyol, where 0.5% 4,4′-methylene diphenyl diisocyanate was used as a coupling agent, to fabricate polyurethane adhesives. Therefore, these aliphatic-aromatic polyesters are potentially biobased and can offer both mechanical and biodegradable alternatives to petroleum-based PBAT.

Closing the Loop: Glycolysis Via Bio-Based Solvent and Regeneration of Bio-based Polyurethane Foams

Presenter: Anirudh Thorbole
Faculty sponsor: Dr. Ram K. Gupta

The quest for sustainable and renewable materials is driving a paradigm shift towards a bio-based economy, propelled particularly by the imperatives of the Sustainable Development Goals (SDGs). The increased use of bio-based polyurethane foams (bio-PUFs) in industrial applications presents a challenge for researchers to develop innovative recycling methodologies conforming to evolving sustainability standards. This research represents an innovative approach to the recycling of bio-PUFs through depolymerization via Glycolysis, employing commercially available bio-based solvent. The degradation and recovery of polyol were validated through FTIR and NMR analysis, confirming the presence of amine groups, urethane linkages, and other byproducts. High yields

(over 93%) of recovered polyol were achieved within comparable timeframes using both bio-based and traditional petroleum-based glycolysis agents. Comparative analyses revealed superior physical and chemical properties of bio-based recovered polyol over its petroleum-based counterpart. The resulting recovered polyol (RP) was utilized to fabricate new PUFs replacing up to 20% w/w of the virgin polyol, exhibiting physical characteristics like virgin PUFs with negligible deviations. Finally, this study outlines the enhanced circularity within the value chain by closing the loop of bio-PUFs through sustainable glycolysis processes, thus contributing to the advancement of circular economy principles.

How Online Gambling Affects the Mental Health Conditions of Individual Gamers At Pittsburg State University

Presenter: Sravya Vemunuri
Faculty sponsor: Tatiana Goris

This research explores the relationship between online gambling and the mental health of individual gamers at Pittsburg State University. As many are addicted to online gambling this help the student get awareness about online gambling. Semi-structured interviews will be conducted for the students to get more information on how online gambling affects their studies. This research will help to identify the risk factors and good strategies to establish the healthy boundaries for online gamers at Pittsburg State University. By educating the students on gambling activities helps them to balance their gaming and academics. The main important outcome of this study hold implementing counseling programs and support groups to address the challenges that students face due to online gambling. Furthermore, the study may provide insights for developing university regulations that promote responsible gaming and address potential problems associated with gambling on campus. Finally, the study aims to create a healthier and more supportive campus environment, allowing students to enjoy online gaming without jeopardizing their mental health or academic performance.

Enhancing Patient Data Security: Utilizing Machine Learning for Cyber Threat Protection in the U.S. Healthcare

Presenter: Vundyala Sumanth Reddy
Faculty sponsor: Tatiana Goris

Patient data is a critical concern in U.S. healthcare, and this research delves into how anomaly detection (Machine Learning) contributes to safeguarding patient information. Many studies have highlighted the growing cyber threats to healthcare data. However, those studies have certain limitations when they are closely examined. Recognizing these gaps, this research aims to explore the effectiveness of anomaly detection in enhancing cybersecurity measures for patient data. The study employs advanced machine-learning techniques, preferably anomaly detection, to predict and prevent cyber-attacks. The research introduces methods that address the shortcomings of prior studies and offer a better understanding of the role of anomaly detection in ensuring the safety of patient data. The findings of the study reveal that anomaly detection significantly enhances the healthcare industry's ability to identify and mitigate cyber threats and provide better defense against potential security breaches. These results have helped in improving cyber security practices

within the health sector in the U.S. This study underscores the significance of integrating anomaly detection into cybersecurity strategies, ultimately contributing to the efforts to protect patient data in health centers.

Category B: primarily Business, Education, and Humanities Undergraduate Poster Presentations

Outdoor Adventure Camp Impact on Emotional Regulation in Youth

Presenter: Allie Johnston
Faculty sponsor: Dr. Shelby Hutchens

Outdoor Adventure Camps (OACs) have proven beneficial for the mental and physical health of youth across age groups (Bowers et al., 2019; Eigenshenk et al., 2019). OACs have typically been reserved for the middle and upper class of the United States and have only recently been made available to low-income groups (Browne et al., 2019). Within the low-income population we also typically see a higher incidence of behavioral issues stemming from emotional regulation difficulties in children (Collins et al., 2017). The purpose of this study is to better understand the beneficial outcomes of OACs with regard to emotional regulation in low-income youth. Participants completed the ERQ-CA at the beginning and end of their week at camp to assess the change in reappraisal and suppression, the two critical components of emotional regulation. This data, alongside counselor journals, and semi-structured discussions led and hosted by counselors on the last day of camp, provided several different perspectives regarding the benefits of OACs with low-income populations. Findings may provide significant support for the funding of more access to OACs for low-income populations.

The Populist Movement in Late Nineteenth century America

Presenter: Ty Scharff
Faculty sponsor: Dr. Kyle Thompson

The Populist movement of the late nineteenth century proved a strong presence in states across the Southern and Western United States for a variety of reasons. Burdensome debt, frustration over monopolies, and overall financial decline characterize the core of Populist's economic grievances, while demands for more direct participation of citizens in politics provide the basis of their political designs. Each state faced its own unique circumstances that Populists were responding to, but these provide a general framework for the movement nationwide. Despite these shared grievances, Populist candidates and parties did not see equal success across the nation. States west of the Mississippi saw a greater degree of victory, with many candidates reaching political office at the state or national level. East of the Mississippi, however, saw Populists comparatively stymied. The reasons for this disparity are complex and varied, but they largely return to the conditions within the states themselves. The economic conditions, political realities, and social divides of the South and West all played critical roles in Populist defeats and victories alike.

Pittsburg State Students' Perception and Utilization of Third Places

Presenters: Braden Zaner and Marissa Dick
Faculty sponsors: Dr. Kristen Livingston and Dr. Malcolm Jason

Third Places have been proven to serve as the social backbone of communities for most of recorded history. While these spaces have shifted drastically in form and function, especially during the current, digital era, most experts believe that they're here to stay. By homing in on students at Pittsburg State University, valuable conclusions can be drawn about the success of campus third places, the value of downtown spaces, and the interplay of these two settings in student life. Long-form interviews were complete with four students about their unique experiences and preferences on third places in Pittsburg Kansas. After the interviews were done the researchers coded the results and discovered three central themes. People tend to choose Third Places for comfortability, productivity, and accessibility. However, these three themes are not mutually exclusive, and sometimes operate in opposition to each other.

Category D: Topical Literature Review
Undergraduate Poster Presentations

Sentence Analysis of Haruki Murakami's *Norwegian Wood*

Presenter: Mackenzie Clevenger
Faculty sponsor: Dr. Philip W. Rudd

The study of an author's unique writing style, specifically the utilization of different sentence patterns and individual diction, is commonly lacking in most craft writing classes or entry level grammar classes, but this study can provide valuable insight into how a particular author's writing style is made effective and encourages readers to keep reading. The purpose of this study is to analyze world renowned author Haruki Murakami's style in his novel *Norwegian Wood* in terms of sentence structure, and examine the deeper structures of his writing by utilizing the ten basic sentence patterns. Within this study, a new method of style analysis is utilized. The Reed-Kellogg system is employed to create a visualized representation of Murakami's style, allowing for a close examination of the structure of writing within his novel. The results of this study show that Haruki Murakami most often used simple, indicative sentences in the simple past tense and active voice.

Will the requirement of Lactation Consultants in hospitals increase breastfeeding rates in the U.S.?

Presenter: Suzanne Eubanks
Faculty sponsor: Barbara McClaskey

In recent years as health in the United States is declining, so are breastfeeding rates. It seems that majority of the people aware of this issue, are specialized in the area of maternal-newborn care and/or breastfeeding. "The fact that breastfeeding rates remain low in many contexts, with substantial gaps between income groups, suggests that countries are not providing women with sufficient information and support. This is an area that requires urgent attention." Improving breastfeeding rates could save more than 820,000 children under 5 every year, and an additional 20,000 maternal deaths from breast cancer.

"Physicians are not often adequately prepared for their role in breastfeeding management. Similarly, nurses have reported breastfeeding training and management as lacking in their education programs." Rather than put more pressure and responsibility on our nation's current healthcare workers, we can contribute to society by requiring Lactation Consultants to be a part of the healthcare team for every birthing hospital. This will allow parents to make more informed decisions when it comes to their baby's nutrition and health. "When women are informed, empowered and supported to breastfeed, the benefits extend to their children, to themselves and to society as a whole."

More studies on the benefits of Lactation consultants/counselors involved in maternal/newborn care should be done to evaluate how advantageous they can be, and to create more awareness for the need of increased breastfeeding rates in the U.S. Hopefully one day leading to the requirement of their position in birthing hospitals.

Education and its Effect on the Over Prescription of Antibiotics

Presenter: Zackary Goswick
Faculty sponsor: Dr. Barbara McClaskey

The purpose of this research is to explore whether providing quality education on antibiotics will, in fact, help limit the number of multidrug resistant organisms (MDROs) infecting the current population. Far too often, antibiotics are prescribed to individuals who do not need them. This overuse causes antibiotics to lose their effectiveness as the human body builds up a tolerance with each subsequent use, thus creating "superbugs." These are organisms that have become unbeatable with the available antibiotics. Over prescription of antibiotics can happen for a myriad of reasons. One of the biggest being patients (frequently parents of pediatric patients) seeking treatment in an outpatient clinic demanding an antibiotic under the impression their sickness will certainly be cured. However, a plethora of organisms other than bacteria, such as viruses, can cause the population to succumb to illness. Unfortunately for these patients, an antimicrobial will not cure a virus. It will only cause issues later down the line in the event they develop a legitimate need for an antimicrobial. Too frequently, providers will comply with these requests and write a script for the aforementioned antibiotic. This denotes the need for education interventions to decrease the over prescription of antimicrobials that are causing MDROs.

Emergency Room Mental Health Services: *Can We Do Better?*

Presenter: Alice Henisey
Faculty sponsor: Dr. Barbara Mcclaskey

The purpose of the research provided is to determine if emergency departments are the best standard of care for patients seeking care during psychiatric and mental health crises. Currently, emergency rooms are the standard initial contact point for those seeking mental health treatment. However, there is a profound lack of quality patient care with psychiatric patients and lack of resources health care providers can provide in these settings. In addition, emergency departments have reported feeling an increased burden with the dramatic increase in this population causing overcrowding and being unable to provide adequate accommodations for these patients' safety. Research has indicated that providing patients with alternative locations for these needs - such as crisis centers or hotlines - has provided better 1:1 patient services and allows for a quicker time frame from onset to stabilization. Although there is a need for more research, there seems to be multiple benefits for the patients' health, safety, and emergency department resources.

Standardization of In-Hospital Cardiac Arrest Recording and Documentation Processes

Presenter: Daniel Mendoza
Faculty sponsor: Dr. Barb McClaskey, PhD, APRN-C, RNC

With the advancement of modern medical practices and technology, the lives of patients have been prolonged, and their outcomes have improved. Patients who were once in intensive care units are now cared for on the medical/surgical ward, while patients who are now in the intensive care units would not have survived a century ago. However, when all measures have been exhausted, a

patient may enter cardiac arrest, triggering a cascade of life-saving interventions in an attempt to achieve resuscitation, more commonly known as a "code blue." The research and implementation of new evidence-based practices has been slow when discussing the processes of code blues, leading to survival rates that have not kept up with those of other medical interventions. Each year, there are over 290,000 in-hospital cardiac arrests (IHCA); of those, only 25% will survive to hospital discharge. The struggle in researching IHCA comes with their infrequency and quick onset, relying on retrospective research. With that, accurate documentation and recording is necessary in order to make significant observations and changes in the code blue process. Interventions that would improve the quality of cardiac arrest recording include incorporating a universal form of documentation across institutions, designating appropriate staff as the recorder in a code blue, adding advanced cardiac life support education to all registered nursing curricula, and establishing a structured environment with proper placement of the recorder during a cardiac event.

Current Amount of Postpartum Care: Is It Effective?

Presenter: Leah Scott
Faculty sponsor: Barbara Mcclaskey

The rates of infant and maternal mortality and morbidity rates are too high. Women are wanting out of the hospital quicker and quicker after they give birth. Women are pushing to be out of the hospital before the end of the 24-hour mark after they have given birth. Studies have shown that even with 48 hours in the hospital, women aren't given enough time to properly learn the information needed recommended/mandated by the government. It was also shown that the warning signs told to mothers for different conditions were not the same based on what nurse was giving it. The most common mechanism for teaching that is used is pamphlets. Nurses are unable to properly meet new mothers' learning needs. There is also not enough time to make sure that baby and mother are stable enough to go home without the risk of readmission. In order to reduce rates of infant and maternal mortality and morbidity rates, longer hospital stays should be enforced. Home visits by a nurse, prenatal education and resources in pregnancy tests can also be used in tandem with longer hospital stays.

Sentence Analysis of Zitkála Šá's *American Indian Stories*

Presenter: Chance Turley
Faculty sponsor: Dr. Philip W. Rudd

In *American Indian Stories,* Zitkála-Šá, also known by her Anglicized and married name Gertrude Simmons Bonnin, describes her early life and tells allegorical fiction through short stories and an essay; her early childhood experiences growing up on the Yankton Reservation in South Dakota, her first journey to "Red Apple Country," the cutting of her hair, and the legends of her people are all detailed by Zitkála-Šá. *American Indian Stories* represents both the rich oral traditions of the Yankton Sioux as well as the tribulations of the assimilation process on Native children while simultaneously evincing the bewitching writing style of Zitkála-Šá. As any terrific book is simply an amalgamation of the words and grammatical structures which it contains, this study focuses on the grammar and usage in Zitkála-Šá's writing and seeks to identify the most common sentence

patterns, sentence structures, mood, voice, and verb tense she employed in her writing. The method utilized the Reed-Kellogg system of sentence diagraming to map a visual-spatial depiction of Zitkála-Šá's writing patterns. The results show that Zitkála-Šá used mostly a mixture of complex and compound-complex indicative sentences in the simple past tense and active voice; likewise, the results demonstrate the author's predilection for the use of adverbial clauses and participial phrases.

Category D: Topical Literature Review
Graduate Poster Presentations

Remarkable Mechanical and Solvent Resistance Properties of Polyurethane Elastomers Based on Betulin Prepared without Need of Catalyst

Presenter: Mansi Ahir
Faculty Sponsor: Dr. Ram K. Gupta

Polyurethane (PUs) are an incredibly versatile class of polymer due to the broad range of chemistries that may be utilized in their synthesis to create an abundance of types and properties. As an example, PU elastomers have outstanding chemical, mechanical, and physical properties together with excellent biocompatibility. An increasing number of people are becoming interested in using sustainable biomass feedstock to produce biobased chemical products. The bark of birch trees contains naturally occurring cyclic aliphatic diol known as botulin which is found in substantial level. In this research, several types of bio-based polyurethane (PU) elastomers with exceptional mechanical characteristics, solvent resistance, and thermal stability have been developed without the requirement for a catalyst using betulin and castor oil (CO) as bio-based polyols. The effects of the hydroxyl ratio between botulin and CO were considered while thoroughly investigating the chemical structure and properties of bio-based PU elastomers. Because of the presence of many hydrogen bonds, stiff ring planes, and other fundamental components in the PU structure, the resulting PU elastomers demonstrated exceptional mechanical properties. They observed maximum tensile strength around 31.6 MPa with a tensile strain of more than 200% could support 1×105 times their weight. The betulin-derived PUs elastomer has a temperature breakdown point of more than 3000 C. This work demonstrated making high-performing, environmentally friendly polyurethane (PUs) materials with a biomass component of at least 75%.

Facile Approach for the Synthesis of Performance-Advantaged Degradable Bio-Based Thermoset via Ring-Opening Metathesis Polymerization from Epoxidized Soybean Oil

Presenter: Enanshu Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

In order to address environmental concerns regarding polymer pollution, the development of polymeric materials that are generated from sustainable sources continues to be the primary focus of attention. Through the utilization of ring-opening metathesis polymerization (ROMP), the objective of this research is to create a thermoset that is derived from biomaterials and is capable of biodegradation. Epoxidized soybean oil (ESO) will serve as the starting point for the procedure. Following the first transformation of ESO into norbornene-functionalized ESO, the thermoset is subsequently generated through the utilization of ROMP, which is a rapid polymerization technique. Because of its outstanding thermal and mechanical qualities, this thermoset, which is produced from ESO, is suitable for use in the production of composites by virtue of its suitability.

Additionally, when it is subjected to aqueous NaOH or KOH, it is capable of totally disintegrating into oligomers and molecules of a very small size after being broken down. In addition, the functionalized ESO has the capability of being copolymerized with norbornene, which may lead to the formation of copolymers that are partially degradable. A viable approach to the creation of thermosets that are biodegradable from vegetable oils for a variety of applications is provided by this technique. As a result, this technique contributes to the development of environmentally friendly practices.

Bioinspired Natural Magnolol-Based Adhesive with Strong Adhesion and Antibacterial Properties for Application in Wet and Dry Environments

Presenter: Janvi Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

Adhesives are frequently employed in various industries like footwear, electronics, automotive, construction, and furniture. Most of the commonly employed thermoset adhesives contain formaldehyde, such as phenol-formaldehyde (PF) resin and urea-formaldehyde (UF). Although they offer economic benefits, their use has prompted concerns about the production of harmful formaldehyde and phenol. Developing ecologically safe, green, and nontoxic adhesives with superior dry and wet adhesion qualities is extremely important. Barnacles and mussels secrete a hydroxyl-rich dopa, resulting in strong adherence. A biobased adhesive made from magnolol (MAG) and pentaerythritol tetra (3-mercaptopropionate) (PETMP) was created using a thiol-ene click chemistry procedure, inspired by the adhesion mechanism. MP adhesives have excellent binding strength with various substrates like wood, PVC, glass, and metal substrates due to hydrogen bonds created by hydroxyl groups at the interface. They also have a thermosetting network structure. MP's thermosetting network provides superior thermal stability, solvent resistance, and mechanical strength, making it robust in conditions of moisture. To alter the degree of cross-linking in MP, modify the molar ratio of MAG and PETMP. The MP 1 formulation has a high elongation at break (174.27%), making it suitable for use as a flexible adhesive. Furthermore, MAG's natural antibacterial capabilities allow for some antimicrobial and antibacterial adhesion. This article proposes a simple biomimetic technique for using MAG in adhesives.

High-Performance Supercapacitor Electrode Materials from Cellulose-Derived Carbon Nanofibers

Presenter: Kemila Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

Nitrogen-functionalized carbon nanofibers (N-CNFs) were prepared by carbonizing polypyrrole (PPy)-coated cellulose NFs, which were obtained by electrospinning, deacetylation of electrospun cellulose acetate NFs, and PPy polymerization. Supercapacitor electrodes prepared from N-CNFs and a mixture of N-CNFs and Ni(OH)2 showed specific capacitances of ~236 and ~1045 F g^{-1}, respectively. An asymmetric supercapacitor was further fabricated using N-CNFs/$Ni(OH)_2$ and N-CNFs as positive and negative electrodes. The supercapacitor device had a working voltage of 1.6 V in aqueous KOH solution (6.0 M) with an energy density as high as ~51 (W h) kg^{-1} and a

maximum power density of ~117 kW kg^{-1}. The device had an excellent cycle lifetime, which retained ~84% specific capacitance after 5000 cycles of cyclic voltammetry scans. N-CNFs derived from electrospun cellulose may be useful as an electrode material for the development of high-performance supercapacitors and other energy storage devices.

Acid-Doped Biopolymer Nanocoating as Flame-Retardant for Polyurethane Foam

Presenter: Nirmalbhai Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

Soft furnishing fires contribute to 29% of fire causalities and $8.7 billion in direct property damage annually in the United States. Polyurethane foam (PUF), a common component in soft furnishings known for its comfort and flexibility, can emit toxic gases and propagate fires due to melt dripping when ignited. Various acid salts were added to a layer-by-layer assembled nanocoating, consisting of chitosan and carboxymethyl cellulose, to improve PUF flame retardancy and to understand the influence of salt-doping on flammability. The 20-bilayer phosphoric acid-doped coating exhibits a self-extinguishing behavior, with a 67% reduction in peak heat release rate while maintaining the structural integrity of the foam. By depositing this completely environmentally sourced coating on PUF, the inherent danger of soft furnishing fires can be significantly reduced in a nontoxic manner.

Morphological and Interfacial Engineering of Cobalt-Based Electrocatalysts by Carbon Dots for Enhanced Water Splitting

Presenter: Ronit Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

Cobalt-based electrocatalysts have garnered significant interest for their potential in water splitting applications. However, their limited functionality, subpar performance, and sensitivity to electrolyte pH levels have hindered their further advancement. In this study, we explored morphological and interfacial modifications of cobalt nanoparticles by incorporating carbon dots (CDs). Specifically, we synthesized nitrogen-doped carbon-encapsulated cobalt nanoparticles (N−C@Co NPs) in situ, aiming for superior performance in electrocatalytic water splitting. These N−C@Co NPs exhibited remarkable hydrogen evolution performance in both acidic and alkaline environments, with overpotentials of 137 mV and 134 mV at 10 mA/cm^2, respectively. Additionally, they demonstrated excellent oxygen evolution performance in alkaline media, with an overpotential of 353 mV at 10 mA·cm^{-2}. These achievements surpass those of many previously reported cobalt-based electrocatalysts and are comparable to several outstanding nonprecious metal-based electrocatalysts. We observed that CDs play a significant role in shaping the catalyst morphology and bonding structure between N−C and Co NPs, revealing synergistic effects for water splitting. Furthermore, we validated this approach by enhancing oxygen evolution reaction (OER) activities using CDs-decorated cobaltic oxide nanoparticles (CDs@Co_3O_4NPs), showing an overpotential of 304 mV at 10 mA/cm^2. This study presents a promising approach for synthesizing stable metal-based carbon hybrids with high-performance photo/electrocatalytic activities.

Toward Utilization of Agricultural Wastes: Development of a Novel Keratin Reinforced Soybean Meal-based Adhesive

Presenter: Sujal Chaudhari
Faculty sponsor: Dr. Ram K. Gupta

The development of low-cost bio-based formaldehyde-free adhesives has aroused widespread interest in the wood adhesive industry. In this study, a series of aldehyde-free adhesives were prepared from soybean meal (SM) and chicken feather (CF), which were both largely produced from agricultural wastes. The incorporation of 10 wt % of keratin and calcium phosphate oligomer (CPO) significantly reinforced the performance of the fabricated adhesive material (namely, SMK10-CPO10). The dry and wet bonding strength of SMK10-CPO10 improved to 3.01 and 1.46 MPa, which was 1.75 and 2.15 times that of the adhesive made with SM alone (1.72 and 0.68 MPa), respectively. Meanwhile, the viscosity of the adhesive decreased from 40.77 (SM alone) to 22.32Pa·s (SMK10-CPO10), which apparently improved the fluidity and wettability of the protein-based adhesive. This work not only put forward a novel method to prepare the green high-performance bio-based adhesive but also opened up a new way for the utilization of waste resources and a new strategy for the design and synthesis of advanced structural and functional materials.

Trends And Challenges in the Development of Bio-Based Barrier Coating Materials for Paper/Cardboard Food Packaging

Presenter: Niyati Chaudhary
Faculty sponsor: Ram K. Gupta

Nowadays, many food and nonfood items are packaged using paper, and one of the main barrier materials utilized in this process is synthetic plastic derived from petroleum. In addition to endangering human and marine health, the extensive use of plastic as a barrier liner degrades the environment. Because biobased alternatives have so many benefits—such as biodegradability, biocompatibility, non-toxicity, and structural flexibility—researchers and food makers are concentrating on them.These biobased substitutes offer good barrier properties against grease, oxygen, bacteria, air, and water, whether used alone or in composites or multilayers. The latest literature findings indicate that biobased polymers for barrier coatings are facing challenges in entering the market. Innovations in bioplastic application and manufacturing technology are developing quickly, opening up new avenues for business and academia to work together to create environmentally friendly packaging solutions. By creating nanocomposites more methodically to get the optimal barrier properties, existing approaches, such as multilayer coating, may be further enhanced. In the future, modified nano cellulose, polyester, and lignin nanoparticles show great promise as high-barrier nanocomposite packaging film materials. The state-of-the-art and research developments in biobased polymeric substitutes, such as board and paper barrier coatings, are included in this study. Lastly, a summary of these biobased polymers' current drawbacks and prospective future development opportunities is given for these barrier materials. Innovations in bioplastic application and manufacturing technology are developing quickly, opening up new avenues for business and academia to work together to create environmentally friendly packaging solutions. By creating nanocomposites more methodically to get the optimal barrier properties, existing approaches, such as multilayer coating, may be further enhanced. In the future, modified

nanocellulose, polyester, and lignin nanoparticles show great promise as high-barrier nanocomposite packaging film materials. The state-of-the-art and research developments in biobased polymeric substitutes, such as board and paper barrier coatings, are included in this study. Lastly, a summary of these biobased polymers' current drawbacks and prospective future development opportunities is given for these barrier materials.

The Synergistic Effect of Ionic Liquid-Modified Expandable Graphite and Intumescent Flame-Retardant on Flame-Retardant Rigid Polyurethane Foams

Presenter: Smit Chaudhary
Faculty sponsor: Dr. Ram K. Gupta

Polyurethanes are large molecules formed by combining substances with hydroxyl groups with Poly isocyanates through polyaddition reaction for many applications like foams, adhesives, coating etc. Rigid polyurethane foams (RPUFs) are created for soundproofing and thermal insulation material. In this study, RPUFs have been modified by using nitrogen-phosphorus-containing flame-retardant, an ionic liquid (IL), and expandable graphite. To confirm the successful synthesis fourier transform infrared (FT-IR) spectra and nuclear magnetic resonance (NMR) spectroscopy have been performed. RPUFs were mixed with IL-EG and DPES to see how it changes the structure of the pore and improves the density and strength of the foam's how it breaks down at high temperatures (thermal decomposition). The tests showed that IL-EG/DPES was better in thermal stability at high temperatures and had a great ability to grow and burn. When IL-EG and DPES were mixed in a 1:1 mixture, the flame-retardant RPUF had the most flame retardancy, the best flame-retardant performance, and the highest compressive strength also when increased the ratio of IL-EG/DPES shows the heat release rate (HRR), and smoke release rate (SRR) decreased significantly. The time to ignition (TTI) shows an increasing trend with high wt.% of flame-retardant. This happened because the IL-EG and DPES formed hydrogen bonds with each other, and the new flame-resistant coating on the RPUF surface stopped gas or heat from getting into the PU matrix.

Targeted Synthesis of Unique Nickel Sulfide (NiS, NiS_2) Microarchitectures and the Applications for the Enhanced Water Splitting System

Presenter: Urvashi Gondaliya
Faculty sponsor: Dr. Ram K. Gupta

Water splitting stands out as an optimal technology to address the continually growing energy demands. This field has garnered considerable attention, with numerous materials being scrutinized for their potential applications. Among these, the family of nickel-based sulfides emerges as a noteworthy example, showcasing intriguing properties pertinent to water-splitting endeavors. In this study, a methodical and uncomplicated approach for synthesizing nickel sulfides is proposed. The process initiates with the creation of nickel disulfide (NiS_2) hollow microspheres through a hydrothermal procedure. Subsequently, meticulous temperature regulation in a specific

atmosphere lead to the preparation of porous hollow microspheres of nickel sulfide (NiS). The effectiveness of NiS_2 in the hydrogen evolution reaction (HER) is demonstrated, exhibiting impressive performance in both acidic and alkaline environments. In acidic conditions, an overpotential of 174 mV is required to attain a current density of 10 mA/cm^2, with a Tafel slope of only 63 mV/dec. Similarly, in alkaline conditions, an overpotential of 148 mV achieves a current density of 10 mA/cm^2, accompanied by a Tafel slope of 79 mV/dec. Meanwhile, NiS proves to be adept in the oxygen evolution reaction (OER), displaying a low overpotential of 320 mV to achieve a current density of 10 mA/cm^2, marking it as a commendable catalyst. These findings inspire the construction of an efficient water-splitting system, incorporating NiS_2 as the HER catalyst in a cathode and NiS as the OER catalyst in an anode. The resulting system exhibits high activity and robust stabilization. Notably, it maintains a stable current density of 10 mA/cm^2 at an applied voltage of 1.58 V, presenting itself as a noteworthy electrolyzer for water splitting.

Amorphous Phosphorus-Incorporated Cobalt Molybdenum Sulphide on Carbon Cloth: An Efficient and Stable Electrocatalyst for Enhanced Overall Water Splitting Over Entire pH Values

Presenter: Fnu Himanshi
Faculty sponsor: Dr. Ram K. Gupta

Developing cost-effective, efficient, and highly durable catalysts to replace expensive noble metal electrodes in electrocatalytic water-splitting applications is crucial. A particularly intriguing and challenging strategy in this regard involves the deliberate design of nanocomposites comprising multiple components with distinct functionalities. Here, we present the synthesis of a robustly catalytic and exceptionally durable electrocatalyst, phosphorus-incorporated cobalt molybdenum sulphide (P-CoMoS), grown on carbon cloth (CC). This hybrid material demonstrates remarkable activity for both hydrogen and oxygen evolution reactions across a wide pH range (1−14), while maintaining extremely high stability (approximately 90% retention of the initial current density) after 24 hours of electrolysis. Notably, when utilized as both cathode and anode for overall water splitting, P-CoMoS/CC achieves a remarkably low cell voltage of 1.54 V to reach a current density of 10 mA cm−2, with the hybrid material exhibiting long-term stability (89.8% activity retention after 100 hours). The exceptional performance in overall water splitting, compared to electrolysers employing noble-metal-based catalysts such as Pt/C and RuO2, positions P-CoMoS as one of the most efficient earth-abundant catalysts for water splitting. The incorporation of phosphorus has been demonstrated to be crucial for enhancing the charge-transfer properties and catalytic durability of the P-CoMoS/CC catalyst.

Cobalt Oxide as Photocatalyst for Water Splitting: Temperature-Dependent Phase Structures

Presenter: Bhumikaben Makawana
Faculty sponsor: Dr. Ram K. Gupta

This study investigated the best phases of cobalt oxide for the photochemical and photoelectrochemical (PEC) water-splitting reaction. Cobalt oxide was produced via a hydrothermal process of cobalt nitrate hexahydrate and then annealed at different temperatures

from 450 ºC to 950 ºC. The Co_3O_4 phase was produced during pre-annealing and annealing at 450 ºC. The mixed phase of Co_3O_4 and CoO was produced during annealing at 550 ºC and 650 ºC, and pure CoO was produced during annealing from 750 ºC to 950 ºC. The Co_3O_4 phase produced the highest photocurrent density with a value of 1.15 mA cm^{-2} at a -0.4 V potential bias vs. Ag/AgCl. This value two times higher than that reported by other researchers at the same potential bias. Furthermore, the highest rate of hydrogen collected by Co_3O_4 was ~272.6 mmol h^{-1} g^{-1} after 8 h photocatalytic process. The amount of collected hydrogen was stable until 12 h of the process. paraphrase this paragraph. In terms of electrochemical performance, the Co_3O_4 phase exhibited the highest photocurrent density, registering at 1.15 mA cm^{-2} when assessed at a potential bias of 0.4 V vs. Ag/AgCl. This measurement notably surpassed values previously documented by other researchers operating under identical bias conditions, constituting a twofold enhancement. Additionally, the Co_3O_4 phase demonstrated remarkable efficiency in hydrogen production, with a peak rate recorded at approximately 272.6 mmol h^{-1} g^{-1} following an 8-hour photocatalytic process. Impressively, this rate of hydrogen collection remained stable throughout the duration of the 12-hour process, indicating the sustained efficacy of the Co_3O_4 phase in promoting the desired catalytic reactions. Through a systematic exploration of cobalt oxide phases generated at varying annealing temperatures, this study elucidated the superior electrochemical properties of the Co_3O_4 phase, particularly in terms of photocurrent density and hydrogen generation rates. These findings not only contribute to advancing the understanding of cobalt oxide's role in PEC water-splitting but also underscore the significance of phase control in optimizing catalytic performance for renewable energy applications.

Urea-Assisted Room Temperature Stabilized Metastable β-$NiMoO_4$: Experimental and Theoretical Insights Into its Unique Bifunctional Activity toward Oxygen Evolution and Supercapacitor

Presenter: Harsh Panchal
Faculty sponsor: Dr. Ram K. Gupta

Room-temperature stabilization of metastable β-$NiMoO_4$ is achieved through urea-assisted hydrothermal synthesis technique. Structural and morphological studies provided significant insights for the metastable phase. Furthermore, detailed electro- chemical investigations showcased its activity toward energy storage and conversion, yielding intriguing results. Comparison with the stable polymorph, α- $NiMoO_4$, has also been borne out to support the enhanced electrochemical activities of the as-obtained β-$NiMoO_4$. A specific capacitance of ~4188 F/g (at a current density of 5 A/g) has been observed showing its exceptional faradic capacitance. We qualitatively and extensively demonstrate through the analysis of density of states (DOS) obtained from first-principles calculations that, enhanced DOS near top of the valence band and empty 4d orbital of Mo near Fermi level make β-$NiMoO_4$, better energy storage and conversion material compared to α- $NiMoO_4$. Likewise, from the oxygen evolution reaction experiment, it is found that the state of art current density of 10 mA cm^{-2} is achieved at overpotential of 300 mV, which is much lower than that of IrO_2/C. First-principles calculations also confirm a lower overpotential of 350 mV for β-$NiMoO_4$.

Controlled Branching by Step-Growth Polymerization of Xylitol and Succinic Acid via Microwave Irradiation

Presenter: Uday Panchal
Faculty sponsor: Dr. Ram K. Gupta

Copolymerization of xylitol usually yields crosslinked materials. In this work, microwave-assisted polyesterification of xylitol and succinic acid produced materials with diverse molecular weights and different branching degrees, and more importantly, no cross-linking was observed, as supported by the solubility behaviour and spectroscopic data. Reactions were carried out for short times, less than 20 min, which is not common for production of industrial polyesters. Control over the branching degree was achieved by tuning the reaction conditions, such as temperature, time of exposure, and monomer ratio, during microwave irradiation. No solvent or catalyst was employed during the step-growth polymerization.

The Production of Eco-Friendly And Biobased Soft Foams Through an Aza-Michael Reaction

Presenter: Sonu Parekh
Faculty Sponsor: Dr. Ram K. Gupta

Nowadays, the depletion of bio-based resources has become an important issue all over the globe. Traditional methods are dependent more on petroleum-based derivatives compared to bio-based materials. In such a scenario, researchers are moving toward replacing fossil fuels with sustainable, biobased resources. Petrochemicals have significant advantages but after use of such kinds of materials shows environmental impact, which cannot be ignored. In addition, these are the non-renewable energy resources, which will be depleted soon. The use of plant-based raw materials is increasing. One of the resources is vegetable oils, which are used as a raw material for renewable polymer synthesis. Nevertheless, these resources face competition from traditional petrol-based monomers. Hence, new research focuses on making eco-friendly foams to replace isocyanate-based polyurethane foams. Aza-Michael reactions were used first to form soft foams, using acrylate soybean oils and biobased amines, with an original chemical blowing system. The properties of the foams have been studied to explore the influence of different structures, such as glass transition, hardness, deformation, etc. The study found homogeneous open-cell foams with a pore size from 0.1 to 0.5 mm were obtained. Flexible foams were obtained with glass transition from −20 to −7 °C. These soft foams recover within seconds and exhibit similar properties to equivalent commercial fossil-polyurethane foams, without the use of highly hazardous chemicals.

High-Performance Bio-Based Polyurethane Antismudge Coatings Using Castor Oil-Based Hyperbranched Polyol as Superior Cross-Linkers

Presenter: Anand Patel
Faculty sponsor: Dr. Ram K. Gupta

Bio-based antismudge coating, as a substitute for the petroleum-based one, has excellent liquid repellency and self-cleaning ability, which is of great value to keep a coated surface free of contaminants. In this study, we report a facile strategy to fabricate high-performance biobased hyperbranched polyurethane antismudge coatings. More specifically, a castor oil-based hyperbranched polyol was employed as a coating precursor, a hexamethylene diisocyanate trimer was used as the curing agent, and a mono-hydroxyl-terminated poly(dimethysiloxane) (PDMSOH) was introduced as a low-surface-tension lubricant through covalent bonding. Consequently, a highly transparent smooth coating was obtained after the coating solution was completely cured. The coating loaded with 0.5 wt % PDMS-OH exhibited superb liquid repellency and self-cleaning ability, as attested by liquids such as water, hexadecane, peanut oil, pump oil, salt solution, strong acid, and strong alkali solutions that could slide off the coated surfaces cleanly. In addition, even after 1000 writing and erasing cycles, the coating still retained its ability to contract ink traces and the contracted ink could be easily removed with tissue paper. Apart from antigraffiti and antifingerprint performance, the coating applied on tin plate surfaces showed an adhesion grade of 5B and a pencil hardness of 3H and displayed superior corrosion resistance. Furthermore, this mechanically robust coating could withstand 1000 abrasion cycles without sacrificing its ink contraction ability. Therefore, this biobased antismudge coating should provide an alternative avenue for developing green and sustainable functional coatings.

Blends of Epoxidized Alkyd Resins Based on Jatropha Oil and the Epoxidized Oil Cured with Aqueous Citric Acid Solution: A Green Technology Approach

Presenter: Dharmikkumar Patel
Faculty sponsor: Dr. Ram K. Gupta

Alkyd resins were made from jatropha oil using a two-step method that included alcoholysis and polyesterification reactions, using 100% Phthalic Anhydride. To enhance their performance properties, the resins were mixed with different wt % of epoxidized jatropha oil (EJO) and aqueous citric acid, without the need for additional catalysts or solvents. Blending was facilitated via epoxidation of the alkyd resins. The prepared blends were characterized by Fourier transform infrared and NMR (1 H and 13C) spectroscopy studies. It was noted that blending led to significant improvements in properties such as curing time, chemical resistance, scratch hardness, thermal stability, and tensile strength of the alkyd resins. In particular, there was a noticeable increase in tensile strength by 3.18 MPa and thermal stability by 42°C when the blends contained 50% EJO. The results indicate the strong influence of the amount of EJO and citric acid on the performance of the alkyd resins. Additionally, the thermal and mechanical properties of the cured films could be further enhanced through post-curing at 160°C. Overall, the results of this study suggest suitability of these blends in surface coating applications.

Bioinspired Natural Magnolol-Based Adhesive with Strong Adhesion and Antibacterial Properties for Application in Wet and Dry Environments

Presenter: Fenilkumar Patel

Faculty sponsor: Ram K. Gupta

The creation of environmentally friendly adhesives with robust dry and wet adhesion qualities has garnered significant interest. Taking inspiration from the adhesive mechanisms observed in barnacles and mussels, which utilize a hydroxyl-rich dopa for strong adhesion, a biobased adhesive named MAG-PETMP (MP) was developed. This adhesive was crafted through a thiol−ene click chemistry reaction involving magnolol (MAG) and pentaerythritol tetra (3-mercaptopropionate) (PETMP). The adhesive properties of MP are attributed to the abundance of hydroxyl groups in MAG, fostering hydrogen bond formation at the interface with other substrates. Additionally, MP possesses an intrinsic thermosetting network structure, contributing to high bond strength and stability. Its thermosetting nature imparts excellent thermal stability, resistance to solvents, and high mechanical strength, ensuring the adhesive's resilience in humid environments. Importantly, the cross-linking degree of MP can be easily tailored by adjusting the molar ratio of MAG and PETMP. Among the synthesized variants, MP 1 formulation stands out with an impressive elongation at break of 174.27%, rendering it a promising candidate for flexible adhesive applications. Furthermore, the inherent antibacterial properties of MAG confer antimicrobial characteristics to MP, offering some degree of protection against bacterial adhesion. This work introduces a straightforward biomimetic approach that harnesses the adhesive potential of MAG. The resulting adhesive, MP, not only demonstrates strong adhesion properties but also incorporates desirable features such as flexibility and antibacterial attributes. Overall, the study presents a viable strategy for the development and application of MAG-based adhesives with environmentally friendly and performance-oriented characteristics.

Phosphorus and Nitrogen-Containing Polyols: Synergistic Effect on the Thermal Property and Flame Retardancy of Rigid Polyurethane Foam Composites

Presenter: Jonsi Patel

Faculty sponsor: Ram K. Gupta

The primary focus of this study was to explore the combined impact of phosphorus-containing polyol (BHPP) and nitrogen-containing polyol (MADP) on enhancing the flame retardancy of EG/rigid polyurethane foam (RPUF). BHPP and MADP were synthesized separately using dehydrochlorination and Mannich reaction methods, respectively. The investigation involved varying the weight ratio of BHPP to MADP and assessing its effects through thermogravimetric analysis and limiting oxygen index (LOI) tests. Results indicated that the most effective weight ratio for flame retarding RPUF was found to be 1/1 for BHPP and MADP. Moreover, the study investigated the potential enhancement in flame-retardant properties by incorporating expandable graphite (EG) into the RPUF/BHPP/MADP system. It was observed that the addition of EG significantly improved the flame-retardant characteristics of RPUF composites. For instance, at an EG content of 15wt%, the LOI value of RPUF composites reached 33.5%, indicating a substantial

increase in fire resistance. Additionally, the peak heat release rate decreased by 52.4% compared to pristine RPUF, further highlighting the effectiveness of EG in reducing flammability. Based on comprehensive analysis and discussion of the experimental results, the study proposed a condensed flame-retardant mechanism. This mechanism elucidated the interactions between BHPP, MADP, and EG within the RPUF matrix, resulting in improved flame-retardant properties. The proposed mechanism provides insights into the synergistic effects of the different components and their contributions to enhancing the fire resistance of RPUF composites. In summary, this study presents a systematic investigation into the synergistic effects of BHPP, MADP, and EG on improving the flame retardancy of RPUF. The findings offer valuable insights for the development of more effective flame-retardant materials with potential applications in various industries requiring fire-resistant materials.

Rubber Seed Oil-Based UV-Curable Polyurethane Acrylate Resins for Digital Light Processing (DLP) 3D Printing

Presenter: Priyankkumar Patel
Faculty Sponsor: Dr. Ram K. Gupta

Novel UV-curable polyurethane acrylate (PUA) resins were developed from rubber seed oil (RSO). Firstly, hydroxylated rubber seed oil (HRSO) was prepared via an alcoholysis reaction of RSO with glycerol, and then HRSO was reacted with isophorone diisocyanate (IPDI) and hydroxyethyl acrylate (HEA) to produce the RSO-based PUA (RSO-PUA) oligomer. FT-IR and ^{1}H NMR spectra collectively revealed that the obtained RSO-PUA was successfully synthesized, and the calculated C=C functionality of oligomer was 2.27 per fatty acid. Subsequently, a series of UV-curable resins were prepared and their ultimate properties, as well as UV-curing kinetics, were investigated. Notably, the UV-cured materials with 40% trimethylolpropane triacrylate (TMPTA) displayed a tensile strength of 11.7 MPa, an adhesion of 2 grade, a pencil hardness of 3H, a flexibility of 2 mm, and a glass transition temperature up to 109.4 °C. Finally, the optimal resin was used for digital light processing (DLP) 3D printing. The critical exposure energy of RSO-PUA (15.20 mJ/cm^{2}) was lower than a commercial resin. In general, this work offered a simple method to prepare woody plant oil-based high-performance PUA resins that could be applied in the 3D printing industry.

Bio-Based Flame-Retardant and Smoke-Suppressing Wood Plastic Composites Enabled by Phytic Acid Tyramine Salt

Presenter: Riya Patel
Faculty sponsor: Dr. Ram K. Gupta

Bio-based chemicals and waste plastic recycling play important parts in the development of a circular economy. Wood-plastic composites (WPCs), composed of recycled plastic and wood-processing residues, offer environmentally friendly alternatives. However, their inherent flammability poses fire hazards. While bio-based flame retardants offer advantages over conventional counterparts, their integration into WPCs remains underexplored. In response, a fully bio-based flame retardant, phytic acid-tyramine salt (PATA), was designed and synthesized using

a green approach with deionized water as the solvent. PATA was then combined with ammonium polyphosphate (APP) to synergistically enhance the flame-retardant properties of WPCs. The PATA/APP system demonstrated significant improvements, augmenting flame retardancy and suppressing smoke generation. This system notably increased the limiting oxygen index by 31% and achieved a V-0 rating in vertical combustion tests. Moreover, it reduced the peak heat release rate, total heat release, and maximum smoke density by 49%, 22%, and 15%, respectively. During combustion, the PATA/APP system generated phosphoric acid substances, facilitating the formation of stable char layers containing P-N-C or P-O-C structures from wood flour decomposition. Overall, this study presents an environmentally friendly approach to enhance the flame retardancy of WPCs. By harnessing bio-based materials and recycling principles, the PATA/APP system offers a promising solution to mitigate fire risks associated with WPCs while contributing to the sustainable utilization of resources in the circular economy paradigm.

Synthesis of Eugenol-Based Polyols via Thiol−Ene Click Reaction and High-Performance Thermosetting Polyurethane Therefrom

Presenter: Sauravkumar Patel
Faculty sponsor: Dr. Ram K. Gupta

The thiol−ene click reaction to prepare biobased polyols is a strategy to promote the green and environmental protection of polyurethane. The excessive usage of thiol and low conversion of carbon−carbon double bonds (C=C) would severely limit the properties of polyurethane (PU). In this work, a set of eugenol-based polyols were prepared via the thiol−ene click reaction. Interestingly, the conversion of the C=C was nearly 100% at the eugenol and various thiol compounds (-SH) in a stoichiometric ratio without excess of -SH. Then, the prepared polyols were reacted with diphenylmethane-diisocyanate (MDI), followed by a series of structure adjustable thermosetting polyurethane networks with colorless transparency, high glass transition temperature (T_g), and good mechanical properties being obtained. In particular, the tensile strength was up to 54.88 MPa, and T_g can be adjusted from 36.45 to 77.21 °C. Moreover, it is revealed that the compounds with an allyl structure are conducive to the efficient click reaction, and its application in PU can be greatly extended.

Vat Photopolymerization 3D- Printing of Dynamic Thiol-Acrylate Photopolymers Using Bio-Derived Building Blocks

Presenter: Tanuj Patel
Faculty sponsor: Dr. Ram K. Gupta

As an energy-efficient additive manufacturing process, vat photopolymerization 3D-printing has become a convenient technology to fabricate functional devices with high resolution and freedom in design. However, due to their permanently crosslinked network structure, photopolymers are not easily reprocessed or repaired. To improve the environmental footprint of 3D-printed objects, herein, we combine the dynamic nature of hydroxyl ester links, undergoing a catalyzed transesterification at elevated temperature, with an acrylate monomer derived from renewable resources. As a sustainable building block, we synthesized an acrylated linseed oil and mixed it with selected thiol crosslinkers. By careful selection of the transesterification catalyst, we obtained

dynamic thiol-acrylate resins with a high cure rate and decent storage stability, which enabled the digital light processing (DLP) 3D-printing of objects with a structure size of 550 μm. Owing to their dynamic covalent bonds, the thiol-acrylate networks were able to relax 63% of their initial stress within 22 min at 180 ºC and showed enhanced toughness after thermal annealing. We exploited the thermo-activated reflow of the dynamic networks to heal and re-shape the 3D-printed objects. The dynamic thiol-acrylate photopolymers also demonstrated promising healing, shape memory, and re-shaping properties, thus offering great potential for various industrial fields such as soft robotics and electronics.

Influence of Keratin on Epoxidized Linseed Oil Curing and Thermoset Performances

Presenter: Vaibhav Patel
Faculty sponsor: Dr. Ram K. Gupta

The study investigates the synergistic potential of keratin, a protein sourced from chicken feathers, in conjunction with a biobased formulation comprising epoxidized linseed oil (ELO) and dodecenylsuccinic anhydride (DDSA). Through techniques such as differential scanning calorimetry (DSC) and in-situ Fourier transform infrared (FT-IR) spectroscopy, the researchers analyze the influence of keratin on the cross-linking process of ELO, elucidating its chemical role in network formation. Findings reveal that keratin exerts a positive influence on various critical parameters of the network, including its glass transition temperature, storage modulus, and tensile strength. This suggests that the incorporation of keratin enhances the overall performance and mechanical properties of the material. Moreover, the study underscores the potential of keratin as a sustainable resource for developing industrially applicable materials, particularly by repurposing chicken feather waste from the food industry. In essence, the research underscores the promising prospects of utilizing keratin alongside biobased compounds like ELO and DDSA to create sustainable materials with enhanced properties. By harnessing natural proteins in this manner, the study contributes to the advancement of eco-friendly materials with practical industrial applications.

Biobased Polyester Composites with Improved Antibacterial Characteristics Are Made By Integrating a Thermally Treated Waste Scallop Shell Modifier

Presenter: Lav Sharma
Faculty sponsor: Dr. Ram K. Gupta

New antibacterial properties of a composite made from thermally treated white scallop shell powder (TWWSSP) and modified polylactide (MPLA) are described. The carbonate waste was calcined at 1000 °C to produce calcium oxide (CaO) and calcium hydroxide (Ca(OH)2). The content and structure of the calcined product were examined using energy dispersive spectrometry, Fourier transform infrared spectroscopy and X-ray diffraction. TWWSSP was tested to establish its efficacy as a bactericidal component when combined with MPLA to produce composites. Infrared spectroscopy, tensile, and morphological research revealed that TWWSSP and PLA adhered better to composites and were more compatible than PLA/WWSSP composites. The

results of the MTT assay and cell adhesion test of composites revealed that the relative growth rate of Mus dunni fibroblast (MDFB) cells rose with increasing TWWSSP concentration in the composites, indicating that the composites were not cytotoxic. Aside from that, MPLA composites including TWWSSP demonstrated significantly increased antibacterial activity of TWWSSP and MPLA, with the highest results obtained with MPLA and TWWSSP. MPLA/TWWSSP and PLA/WWSSP composites have excellent antibacterial and biodegradable qualities, making them ideal for a wide range of applications, particularly food packaging and biomedical products.

Potentially Biodegradable "Short-Long" Type Diol-Diacid Polyesters with Superior Crystallizability, Tensile Modulus, and Water Vapor Barrier

Presenter: Jainishkumar Patel
Faculty sponsor: Dr. Ram K. Gupta

Long-chain aliphatic polyesters are potentially biodegradable polymers with PE-like structures and properties. To develop biodegradable long-chain polyesters for practical applications, a series of "short-long" type long-chain polyesters, PEsxy (x = 2−4, 6, y = 10−16), are designed and synthesized from C2−4,6 short-chain α,ω-diols, and C10−16 long-chain α,ω-diacids via melt polycondensation. They showed intrinsic viscosity as high as 0.93− 1.64 dL/g and PE-like crystal structure, rapid crystallization, and ductile tensile behavior. Their crystallization and melting temperature showed an increasing trend with diacid chain length and an apparent odd−even effect. The highest melting temperature reached 94 °C, and the highest tensile strength came at 53 MPa. Chain length-dependent biodegradability in soil and hydrolytic degradation under neutral conditions at 30−60 °C was also observed. In comparison with the widely used biodegradable poly(butylene adipate-co-terephthalate) (PBAT) copolyester, these polyesters show comparable tensile strength, flexibility, and oxygen barrier performance but superior and desirable crystallizable, tensile modulus, and water vapor barrier performance.

Category A: primarily Sciences and Technology
Undergraduate Oral Presentations

Using Automated Radio Telemetry to Track Gray Bats in Southeast Kansas

Presenter: Braidy G. Hunt
Faculty sponsor: Andrew D. George

The Gray Bat (*Myotis grisescens*) is a federally endangered species that reaches the westernmost limit of its geographic range in southeast Kansas. Gray Bats are migratory, traveling biannually between summer colonies and large communal hibernacula. However, little is known about the timing of migration, routes taken, and connectivity among caves. Our objective was to track migrating Gray Bats using the Motus automated telemetry network, an international collaborative project for tracking migratory animals. In October 2023, we attached 20 transmitters to Gray Bats near Pittsburg, Kansas. We also deployed Motus nodes at the two known roost exits to detect the presence of tagged bats and estimate their departure dates. Though hibernacula have not yet been identified, our preliminary results suggest that Gray Bats departed from their summer roost near Pittsburg in late October and early November, traveling east into Missouri. We plan to track an additional 30 bats in the fall of 2024. The expanding Motus network will continue to enhance our understanding of the movement of Gray Bats and other migratory animals.

The Cat's Out of the Bag: Comparing the Presence of Bobcats and Domestic Cats Across Land Cover Types in Kansas

Presenter: Khloey Stringer
Faculty sponsor: Dr. Christine Brodsky

Bobcat (*Lynx rufus*) populations in the Midwest have experienced declines since the mid-1900s. Consequently, species such as the domestic cat (*Felis catus*) may start to fill the niche of this predator, especially in more anthropogenically-altered habitats. We compared the habitat associations of bobcats and domestic cats across land cover types in southeast Kansas. We hypothesized that interspecific competition occurs between the two species, resulting in bobcats being detected more often in forests and domestic cats in urbanized habitats. We used data collected from 398 camera traps across 12 counties in southeast Kansas to test our hypotheses. We ran independence tests and generalized linear models to examine the influence of domestic cat occurrence on bobcat occurrence. We also performed non-metric multidimensional scaling analyses for both species to examine their landscape habitat associations and determine their degree of habitat overlap. We detected 350 unique bobcat detections across 168 unique sites and 200 unique domestic cat detections across 61 unique sites. We rejected both hypotheses, as bobcats were equally detected at locations with and without domestic cats and both species were found across habitat types in Kansas. Future research should explore other features regarding the distribution of bobcats across the landscape, such as prey availability and land cover diversity, to provide insight into their population declines in the Midwest.

How to train your opossum: Captive Virginia Opossum (*Didelphis virginiana*) Responds to the Color Red After Positive Reinforcement Training

Presenter: Leann Trout
Faculty sponsors: Delia Lister and Christine Brodsky

Positive reinforcement is an animal training method in which a reward (reinforcer) is used to get an animal to perform a desired action given by a trainer. It is helpful for captive animal management, especially for providing medical care or getting an animal to stop an unwanted behavior without use of punishment. My research project aimed to determine if a food-based reinforcer would motivate a captive female Virginia opossum (*Didelphis virginiana*) to complete a task before and after positive reinforcement. I first trained the opossum to associate the color red with the reinforcer by presenting a piece of cheese to her on both the floor and a red poly dot. After this training, I used a red-tipped training stick to test her ability to touch her snout to the end of the stick. Although the amount of touches decreased after exposure to positive reinforcement, the opossum did associate the color red with the reinforcer. Further training with color association could help the opossum with getting into a harness, a carrier, or other actions she may need to perform in the future. Findings from my research project demonstrate the usefulness of color association with positive reinforcement in captive animal management.

Introduction of a Novel Food Resource And Obstacle Are Promising Enrichment Tools For The Captive Prairie Kingsnake (*Lampropeltis Calligaster*)

Presenter: Renee Trout
Faculty sponsors: Delia Lister and Christine Brodsky

Enrichment, such as introducing obstacles or novel foods, enhances captive animals' quality of life by providing a stimulating environment the animal may not otherwise experience in a captive setting. We sought to determine if the introduction of a new food source (i.e., day old chicks) and a maze (i.e., plastic tube) would serve as good enrichment tools for a captive prairie kingsnake (*Lampropeltis calligaster*). Our hypotheses were that the kingsnake would preferentially consume the novel food source and choose to interact with the maze. In two trials 14 days apart, we introduced one novel food item and its current food item (i.e., rodent) to the prairie kingsnake and observed if the snake preferentially ate the new food item over a 24-hour period. The prairie kingsnake did not consume chicks in either trial; however, it also did not consume any rodents. When offering the maze across six trials, the kingsnake entered and exited the maze five times. Overall, while the kingsnake chose not to consume any food items, the introduction of chicks as an enrichment tool may show promise if used over an extended time. The maze was a successful enrichment tool for the kingsnake, as the snake completed the maze; however, more research is needed to determine if other captive snakes will use the tube. Utilizing multiple means of enrichment for captive snakes is not yet considered a standard practice; however, captive snake keepers should consider multiform enrichment for its benefits of both physical and cognitive stimulation.

Category A: primarily Sciences and Technology
Graduate Oral Presentations

Advanced Casting Design Using Additive 3d Printing and Casting Technology for Reduced Lead Time, Cost Savings And Resource Consumption.

Presenters: Austin Frazier and Nathan Minuth
Faculty sponsor: Dr. Rosmait

This project is a research endeavor that will investigate the capabilities of 3D sand printing within the sand-casting industry. Sand Casting is a cost-effective technique for the production of complex components from practically any metal alloy. The combination of the application of pouring metal into a 3D printed sand mold is becoming extremely popular.
Manufacturers who need to produce large parts in the shortest lead time possible benefit greatly from this advanced casting process. 3D sand printing allows for much more complex and intricate part designs. Because 3D printing involves building up a part layer by layer, cavities and intricate details in the digital design file can easily be achieved. Additionally, in conventional manufacturing, the more complex the part
is, the more expensive it is due to the time and materials needed. That is not the case with 3D sand printing, as the price only increases when more material is needed. The more complex the core or mold, the better the case for additive manufacturing.

Spatiotemporal Changes in the Imperiled and Diverse Mussel Assemblage of the Spring River in Response to Known and Emerging Pollutants

Presenter: Joshua Holloway
Faculty sponsor: James Whitney

The Spring River of southeastern Kansas is home to a diverse assemblage of 34 mussels, many of which are imperiled. Elevated metal concentrations that resulted from past mining for lead and zinc in the Tri-State Mining District historically imperiled Spring River mussels, but this threat has abated over the last 20 years. Ammonia pollution may have replaced the threat of metals however, with potentially severe consequences for Spring River mussels. Our objectives were to evaluate spatiotemporal trends in density and richness of Spring River mussels in relation to changing concentrations of metals and ammonia. We accomplished this objective by performing quantitative mussel surveys across eleven Spring River sites during the summer of 2023, and we then compared our data to surveys performed during 1993-1995 and 2003-2005. We found that mussel densities had declined in the upper Spring River reach that historically was minimally-impacted by metals, while densities in the previously metal-contaminated reach above Empire Lake had increased. Mussel density and richness below Empire Lake were low historically and remain as such. These patterns were consistent with ammonia as the causative agent behind mussel declines in the upper reach, as concentrations were highest near the Missouri border and decreased downstream.

Prevalence of Ticks and Tick-borne Pathogens in Mined Land Areas of Southeast Kansas

Presenter: Brayden Letterman
Faculty sponsor: Anuradha Ghosh

Ticks serve as vectors for many disease-causing pathogens, particularly bacterial and rickettsial pathogens. Diseases such as Lyme, Anaplasmosis, Ehrlichiosis, Rickettsiosis, Rocky Mountain Spotted Fever, and Tularemia can result after bitten by ticks. These tick-borne diseases are more common in the Great Plains region than is recognized. The present study aimed to conduct a three-year long surveillance on various tick species in the mined land area in Cherokee County (KS) using dry ice bait as well as flag-drag technique. Over several visits (June 2020 – Aug 2022) to the collection site, ticks were collected using both trapping methods. Detailed environmental data was also collected during each visit on-site. Collected ticks were brought to the lab in vials kept in ice-cooler and differentiated by species, sex, and life stage in the laboratory using a dissecting scope. A total of 1880 adults and nymphs as well as 280 larvae were collected from both woodland and grassland areas. The majority of which were identified as Amblyomma americanum (90.1%; Males-384, Females-433, Nymphs-877) followed by Dermacentor variabilis (9.9%; Males-65, Females-79, Nymphs-42). Pathogen testing on these ticks are being carried out by our collaborator at Oklahoma State University. This long-term ecological study will help better understand the variations in tick-pathogen prevalence influenced by various environmental parameters and thus appropriate management programs can be implemented to reduce the risk for human/animal diseases.

Low Socioeconomic Status Negatively Impacts Field-Test Battery in College Aged Women

Presenter: Adam Mortensen
Faculty sponsor: Dr. Tristan Ragland

Low socioeconomic status (SES) has been shown to increase risk factors of health disparities. Likewise, field tests are often used as a practical way to determine disease risk. PURPOSE: To investigate the influence of SES on cardiovascular health and physical fitness among female D2 university students. METHODS: 249 college-aged women were recruited and split into six groups based on their parents' reported income. The six SES groups are as follows: Group 1 (n=27, $20-$32K); Group 2 (n=45, $32K-$60K); Group 3 (n=63, $60K-$100K); Group 4 (n=51, $100K-$150K); Group 5 (n=26, $150K-$250K); Group 6 (n=8, $250K+). A battery of field tests was conducted, including weight-height ratio (WtHR), blood pressure (BP), body fat percentage (BF%), waist-to-hip ratio (WtoH), handgrip strength (HG), push-ups (PU), sit-ups (SU), body mass index (BMI), heart rate recovery (HRR), and fitness capacity (VO2max). RESULTS: Compared to all SES groups, women in the lowest SES group had higher WtHR ($P<0.06$), BF% ($P<0.03$), BMI ($P<0.004$), but lower VO2max ($P<0.04$). Lowest SES also showed lower PU to mid-SES groups ($P=0.04$), SU ($P=0.03$), as well as higher HRR compared to mid- and high-SES ($P<0.04$). However, there was no difference in BP, WtoH, or HG between groups ($P>0.05$). CONCLUSION: College aged women in the lowest SES group exhibited worse health outcomes compared to those of higher SES. Thus, low familial SES seems to negatively affect health

outcomes in college aged women. Further investigation on how to overcome SES health disparities is warranted.

Category B: primarily Business, Education, and Humanities Undergraduate Oral Presentations

Winston Churchill and the Beginnings of the Cold War

Presenter: Jocelyn Brokob
Faculty sponsor: Dr. M. K. Thompson

Many historians such as David Reynolds and J. Samuel Walker mark the beginning of the Cold War with Winston Churchill's Iron Curtain speech in Fulton, Missouri. Other historians, such as Jennifer Luff have argued, however, that anticommunism attitudes had existed in the United States of America (USA) long before the threat of the Russian Soviet Union (USSR), and these attitudes were only amplified by the words of Churchill. Historians have long examined the attitudes of the USA and the United Kingdom (UK) toward socialism and communism in the year before, during, and after World War II. While both countries struggled with the idea of communism, their reactions, and general attitudes to social were dramatically different. This paper examines sources to determine how the USA and the UK came together against the USSR to stop the spread of communism. There are many theories about how, when, and why the tensions between the Americans and the Soviets rose to the heights that they did. Some historians cite Churchill as the instigator while others side with the idea that these tensions had existed for decades before the threat of the USSR. By examining the carefully curated image of Churchill and the American attitudes about the Soviets and socialism in general this paper argues that Churchill's speech was taken as a call to action for the Western powers to come together in the fight against communism.

The Economic Reasons for the Downfall of Yugoslavia

Presenter: Hayden Hunter Calovich
Faculty sponsor: Dr. Kyle Thompson

As communism in Europe started to falter in the late 1980s and continued throughout the 1990s, some communist nations had a peaceful transition out of communism, while others had violent conflict tearing down their old governments. Yugoslavia was unique as it was a communist nation in Europe that was not part of the Warsaw pact and when its communist government collapsed so did the entire country. This collapse led to the Yugoslav Wars, which led to the creation of new states drawn on historical ethnic lines. Because the new states based on ethnic lines ushered in genocidal actions and reprisals. Some historians have argued that the collapse was due to ethnic lines, however a more nuanced approach can be taken. This paper argues that economic issues caused the initial conflicts. The increased liberalization of the economy and the increased autonomy of the independent republics, which were drawn on "historical" as well as economical lines, ushered in the perfect storm for disaster. The economic framework that was established by the Yugoslav system, known as "Market Socialism," was the reason for Yugoslavia's downfall and with minor tweaks to the system could have allowed for the continuation of the state if more level heads in Belgrade had prevailed.

Consumer Education of Fast Fashion

Presenter: Tricia Combs
Faculty sponsor: Dr. Malcolm Jason

This quantitative research study explored whether consumers are less likely to engage in fast fashion if they are educated on the subject. The study surveyed 114 individuals' demographics, shopping habits, and knowledge of the fast fashion industry to determine if education plays a role in consumption. According to existing literature, the general trend when examining fast fashion consumer habits can be attributed to the “low price quest” which often is why fast fashion's social and environmental costs are ignored. With many fast fashion concerns revolving around sustainability or conservation, it tends to be overlooked as a serious issue because it does not directly apply to the public. Components such as knowledge of fast fashion, likelihood of purchasing from fast fashion retailers, and feelings toward the issue were measured before and after being exposed to an informative paragraph about the impact of fast fashion. According to the survey results before exposure, 32.5% of individuals who were not aware of the issue of fast fashion, 48.2% of individuals classified themselves as an “aware public” meaning they are aware of the issue but do not seek action, and 19.3% of individuals stated they were an “active public” meaning they are aware of the issue and seek corrective action. Post-exposure results were positive and indicated that individuals are more likely to seek corrective action (47.4%) than ignore the issue (43.9%) after being informed of the environmental and ethical impact. Additionally, individuals who were not aware of fast fashion being an issue decreased to 8.8%.

Unknown Title

Presenter: Kaleb Grotheer
Faculty sponsor: Dr. Thompson

Imperial Japan in the Second World War is Infamous for its aggressive militaristic policies. This aggression was generated by young ambitious officers in both the Army and Navy General Staffs which spurred their venerated military leaders into more radical action often without the Imperial government’s sanction. The military wielded the perceived divinity of the emperor as a motivating factor in their actions. Some historians have argued that Emperor Hirohito was complacent or secretly instigating such aggression. This paper seeks to demonstrate that the emperor sought more restraint and caution in action and that despite his prestigious and sacred position, or because of it, was unable to effectively rein in the ambitions of the military culminating in an intransigent aversion to ending the war.

A Historiographical Inquiry into the 1918 Influenza Pandemic

Presenters: Anthony Guarino
Faculty sponsor: Dr. Kyle Thompson

The 1918 Influenza Pandemic remains one of modern history’s most impactful global health crises, claiming more lives globally than the concluding Great War. Over the years, many scholars have conjectured over the point of origin of this infection. This paper aims to examine several of these past theories in the context of each other and recent data. Previous origin theories examined include

John Oxford's European theory, Claude Hannoun and Mark Humphries' Chinese origin theory and John Barry and Alfred Crosby's United States theory. None of these theories have yet to provide a definitive answer, however cross-referencing their analyses shows a compelling convergence of evidence supporting the Chinese origin theory.

The Determinants of Housing Prices in Micropolitan Areas

Presenter: Caden Hughes
Faculty sponsor: Dr Michael Davidsson

Defined in 2003 by the US Office of Management and Budget, Micropolitan areas consist of 10,000 to 50,000 residents, and are partially considered to be emerging metropolitan areas. Given their relatively recent definition, the vast majority of research does not pertain to the micropolitan definition. Using a data set of 500+ micropolitan areas across 600+ counties in the contiguous 48 states, this study aims to seek out and identify intrinsic and socioeconomic determinants of housing prices in micropolitan areas, as well as analyze the severity of their impact, by way of linear OLS regression. The intended impact would be painting a better picture of housing affordability and providing better understanding on housing price fluctuations in areas like our very own Pittsburg, KS. Using these findings, Pittsburg officials and citizens would be provided a better insight on how to upkeep housing value, and derive cultural and social norms that add to the property value of the city, both from an investors and a resident's perspective.

Minority Poverty

Presenter: Mario Kirby
Faculty sponsor: Michael Davidsson

The abstract explores the complex dynamics of poverty within minority communities, with a particular focus on the Minority community, drawing from a range of scholarly sources. It emphasizes the interconnectedness of various factors contributing to poverty, including structural inequalities, economic policies, and individual circumstances. Educational differences emerge as a significant theme, with minority students facing resource deficiencies and limited access to opportunities for academic enrichment. The social and emotional effects of poverty are also discussed, highlighting how financial instability and stress at home can impact students' mental health and overall well-being, potentially leading to academic struggles and risky behaviors. Additionally, limited access to resources and support services intensifies the challenges faced by individuals from economically disadvantaged backgrounds in their pursuit of employment. Emphasizing the need for collaborative efforts to address systemic barriers and create pathways to economic opportunity and social mobility for all individuals, regardless of their socioeconomic background.

Determinants of Crime

Presenter: Andersen Meek
Faculty sponsor: Dr. Davidsson

This study examines the determinants of crime in metropolitan areas. Cities all around the world deal with crime. Crime detrimentally impacts society by impeding economic growth, social instability, undermining safety, and many more negative effects. This paper aims to use existing international research, thereby facilitating a comprehensive understanding of the determinants of crime in metropolitan areas. This research investigates certain socio-economic factors that influence the crime rate in metropolitan areas such as income, population density, and unemployment. The goal of this research is to contribute to bridging the gap in our understanding of the determinants of crime. By identifying and understanding the underlying causes of crime can lead to effective strategies for reducing the overall crime rate.

Affordability Timeline in Kansas: Change in Home Prices and Income in the 2000s

Presenter: Maleah Poole
Faculty sponsor: Michael Davidsson

The housing market in America has been a popular topic of conversation throughout the years and that does not seem to be slowing down anytime soon. Everyone wants to know why it is getting harder and harder each year to buy a home here in America. Housing prices seem to be rising and income does not seem to be following the same trend. This is making it extremely difficult for the average American to buy a home. Throughout my research I mostly focused on the housing market in Kansas and how it has changed over the years. The state of Kansas is historically known for being an affordable place to live compared to other areas in America. There has been a noticeable change in the affordability of living in Kansas since 2021. To measure this change, we compared the ratio of home prices to median household income in Kansas. After looking at this ratio from the years 2000 - 2023, we found a noticeable shift that starts in 2021 and is increasing to this day. This means that Kansas might be becoming a less affordable place to live. Currently the ratio is the highest it has ever been in all of history. The purpose of this study is to better understand how the affordability of living in Kansas has changed throughout the years. We will be doing this by creating a timeline of affordability in the hopes of answering the question; Is Kansas becoming a less affordable place to live?

Category A: primarily Sciences and Technology
Undergraduate Virtual Presentations

Comparison of County and City Law Enforcement Agencies Responsibilities and its Effects on its Community Relationships

Presenter: Alyssa Tyler

This study's purpose was to identify the differences between two law enforcement agencies: Crawford County and the Girard Police Department. To do this I performed two ride-along and conducted interviews during those rides. After conducting my interviews and research, I then focused on analysis, and looking at how these differences affect the deputies and officers employed by the agency.

I have also included research conducted from the last year. A small survey from students at Pittsburg State University and were asked how they felt towards their hometown law enforcement agencies. The purpose of this study was to find differences and similarities between the law enforcement agencies, considering their sizing, funding, and population they serve.

The sampling was small and does not represent all law enforcement agencies within Kansas, Southeast Kansas, Crawford County, or the City of Girard. However, this research can be used to compare the two agencies and can help guide those interested in pursuing a career in law enforcement.

Category A: primarily Sciences and Technology
Graduate Virtual Presentations

The effect of Education Path and Nursing Specialty on Knowledge and Attitude Survey Regarding Pain Scores

Presenter: Justin Cope, BSN, RN
Faculty Sponsors: Dr. Ashleigh Heter, Dr. Barbara McClaskey, Dr. Greg Belcher

Pain is reported as the number one fear of patients, and has been shown to stop patients from seeking necessary medical treatment in a timely manner. Therefore, it is important that health care professionals be able to properly assess and treat pain. One area though not previously studied is how degree path affects knowledge acquisition.
The purpose of this study is to determine the effect of structured education and clinical experience on general pain knowledge between traditional and non-traditional Bachelors of Science in Nursing students. Participants of this study include RN-BSN students and traditional BSN students who have completed the Adult Medical-Surgical course. Participants completed a forty-five-question assessment including the Knowledge and Attitude Survey Regarding Pain. Also collected were degree path, years of nursing experience if applicable, and any specialty nursing experience. Twenty-one responses were received with twenty completed submissions. One-half of submissions were BSN with the other half being RN-BSN. Competency is established with scores above 70%. Total scores for all groups indicate inadequate knowledge and negative attitude regarding pain (M=69.27%, SD=9.83). BSN cohort scores demonstrated inadequate competency and negative attitude (M=65.85%, SD=10.089). RN-BSN cohort scores were slightly higher and demonstrated competency and positive attitude but scores were not statistically significant (M=72.68, SD=8.741, p=.123). The small sample size may affect generalizability. Major area of deficiency was pharmacology-based questions.
Implications for this study include evaluating current nursing curriculum to correct deficits in student knowledge acquisition. Lessons learned relate to how vast the current knowledge deficit is amongst nurses worldwide.

Decreasing Overall Breast Cancer Risk Through Assessment, Treatment, and Prevention of Vitamin D Deficiency in the Adult Population

Presenter: Rachel Jamison, BSN, RN, DNP Student
Faculty sponsors: Dr Tracy Stahl, Dr Jennifer Harris, and Dr Greg Belcher

The primary objective of this study is to examine the effectiveness of an educational initiative aimed at enhancing nurse practitioners' understanding and recognition of vitamin D deficiency. The purpose of this program is to equip them with the skills to screen, diagnose, and manage this condition to mitigate the overall risk of breast cancer in patients. Vitamin D deficiency is a prevalent global health issue that affects over one billion people, and it can manifest at any stage of life without showing any symptoms, making it challenging for healthcare providers to detect. However, even mild or prolonged deficiencies can lead to an increased risk of osteoporosis,

cardiovascular disease, diabetes, and specific types of cancer. Breast cancer is a major global health concern that affects millions of women every year, with studies suggesting that low serum vitamin D concentrations could contribute to an increased risk of breast cancer, recurrence, and mortality. A significant proportion of breast cancer survivors have inadequate levels of vitamin D. To evaluate the impact of the educational intervention, this quasi-experimental study will use a pre- and post-test approach, with participants recruited via a private social media group for advanced practice nurses in Southwest Missouri, Southeast Kansas, and Northeast Oklahoma. The data collected will be analyzed to determine if the educational initiative has enhanced practitioners' awareness of vitamin D deficiency and their confidence in integrating it into their clinical practice.

Christian-Based Health Promotion Program

Presenter: Amber Vail
Faculty sponsor: Janis Schiefelbein

Chronic diseases are on a rise and placing hardship on healthcare in the United States. Regular physical activity and consumption of fruits and vegetables have proven to have health benefits related to decreasing chronic disease and improving the management of chronic diseases. A majority of the United States adult population do not meet the recommended guidelines that are set forth by the CDC. The purpose of this six-week Christian-based health promotion program was to improve the health of individuals in the congregation by increasing each individual's weekly physical activity and daily fruit and vegetable consumption. These two key factors were the target while using biblical foundation along with motivational counseling to promote lifestyle changes. It used a pre-survey and post-survey with an intervention in between which included six weeks of seminars that educated and motivated participants to make these lifestyle changes. Participants of the program were primarily white females that attended the seminars face to face from all adult age groups. There was significant improvement in the participants' amount of physical activity and consumption of fruit and vegetable consumption after intervention compared to before intervention. The overall purpose was to reduce the risk for chronic diseases of the Christian population so that participants can live a healthier life to be able to glorify Jesus. This reduction was achieved by having an overall increase in physical activity and consumption of fruits and vegetables with those who participated in the study.

Category B: primarily Business, Education, and Humanities Graduate Virtual Presentations

Guided Inquiry Design Lesson: Claim to Fame – Biographies and Facts

Presenter: Meagan Vestal
Faculty sponsor: Dr. Liz Mascher

My son participated in a Wax Museum project in elementary school that I found fascinating. When presented with the opportunity to create my own project, I was inspired to do something similar. This project was a culmination of the entire graduate course, Information Literacy and Inquiry. Throughout the semester, while utilizing Guided Inquiry Design, I worked on this project which focused on creating a full lesson plan that covers every stage of Guided Inquiry Design while also being built to accommodate different teaching and learning styles. This assignment included several resources, most of which were created by myself using the program Canva. It focuses on library skills, research, and presentation, and is taught by an inquiry team consisting of a classroom teacher, technology teacher, librarian, and art teacher. The Guided Inquiry Design lesson was challenging but, in the end, I learned the value of constructive feedback, taking another look at my ideas and thoughts, and changing directions. This project is also part of my program portfolio as it meets the ISTE Coaching Standard 4.4 – Learning Designer. By creating a lesson plan for Guided Inquiry Design, I created an effective digital learning environment that allows me or any educators to model instructional design principles. This project can easily be modified to meet the needs of learners and educators alike and was built to accommodate the many different learning styles and paces of learners. Educators using this artifact can model the effectiveness of Guided Inquiry Design while also promoting engagement and creativity.

Category D: Topical Literature Review
Graduate Virtual Presentations

Increasing Student and NP Faculty Satisfaction Using Simulation: A Literature Review

Presenter: Rhonda D'Agostino
Faculty sponsor: Dr. Jennifer Harris

Simulation is an immersive experience allowing learners to gain understanding of real conditions to improve their knowledge, skills, and attitudes. The National Organization for Nurse Practitioner Faculty (NONPFT) released guidelines for NP faculty on best practices and guidelines for simulation yet implementation into graduate programs has not been fully implemented. This review explores current evidence on simulation effectiveness, student and faculty satisfaction, best practices, evaluation, debriefing, and the effectiveness of faculty development simulation education program (FDSEP) on faculty knowledge and attitudes. The literature provides evidence that simulation is an effective teaching strategy promoting critical thinking, increased knowledge acquisition, interdisciplinary communication. Students are highly satisfied and have increased self-confidence after simulation. Faculty who are competent in facilitating simulation are satisfied with student learning and bridging theory to practice. Simulation-based faculty development programs can improve faculty knowledge and confidence in effectively facilitating simulation debriefing.

Category E: High School

Swine Feed Efficiency Trial Study

Presenters: Bridget Andon, Levi Simmons, Jesus Nunez
High School: Upward Bound Math & Science Program – Crowder College
Faculty sponsor: Kylie Hackworth

For this project, we tested if high protein feed is preferable to normal feed. We split pigs of the same litter into two groups. We fed one group high protein feed and the other group normal feed. We also compared the price of each feed and saw which feed was more profitable. Both groups were fed at the same time, same amount, and weighted on the same days. After four months, there was a significant difference between the two based on what they were being fed. In conclusion, our hypothesis was proven correct. The high protein feed allowed them to gain more weight compared to the normal pig feed. After the experiment, the high protein feed proved to be 6.78% more successful than the normal feed for the gilts and for the barrows it was 15.34%.

Effectiveness vs Cost Efficiency of Denser Protein Feed

Presenters: Chung Awr, Raina Bartlett, Jonathan Heck, Quentin Pierce
High School: Upward Bound Math & Science Program – Crowder College
Faculty sponsor: Kylie Hackworth

Our study shows the effects of two different types of pig feed, one is an 18% protein feed that was a test feed and the second is a 16% protein feed that is used normally for Crowder College. Through our study we found out that the 16% feed that we use now was slightly more worth it than the 18% feed solely due to the fact that it was cheaper and more cost effective even at a lower cost because the 16% only took two more weeks to grow to a large enough size to be able to sell off for profit which is not much time in reality. We explain the full effects of the two feeds and have extensive research stemming from multiple different graphs and points showing the true differences between the two types of feed. Our results even provide reason that the 2% increase in protein does not add up to the cost of it and shows reasonable benefits with less costs where the 18% has virtually similar benefits with higher costs.

Out of the Forest and into the Urban Jungle: Habitats of the Red Fox in Missouri

Presenters: Kayelee Crane, Karys Crawford, and Isabel Reddick
High School: Lamar High School, Hume High School, and El Dorado Springs High School
Co-author: Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

Red fox (*Vulpes vulpes*) are a common mesocarnivore species found throughout North America. This species is often found in urban areas worldwide, as the diet of the red fox is primarily small rodents and rabbits, which are often found in suburban and urban habitats. Thus, we hypothesized that red fox would be detected most often in urban areas of Missouri. We downloaded red fox

observation data from iNaturalist, an app in which the community can report sightings of local flora and fauna. We used data from the National Land Cover Database to extract the land cover type surrounding the location of each red fox observation. A total of 241 red fox observations were reported on iNaturalist, the majority of which occurred in cities such as St. Louis, Columbia, and Kansas City, Missouri. Most red fox observations were within urban land cover, specifically medium intensity development (50-75% impervious surface), with fewer detections reported in forest and grassland habitats. We were able to accept our initial hypothesis as red fox were reported in more urban areas, even though we do acknowledge that iNaturalist observations are typically biased towards areas with people. We would suggest that future research would include a systematic survey of red fox along urbanization gradients in St. Louis using game cameras. It would be interesting to see what habitats red fox are utilizing within urban lands and if they are shifting their activity patterns to be more active at different times of the day in more urban areas.

Venomous Snakes of Missouri

Presenters: Ryland Oakes, Zion Plotner, and Jacob Webb
High School: Butler High School
Co-author: Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

Snakes are an important aspect of Missouri's ecosystems, serving as predators of rodent pests, and are themselves prey for birds, mammalian carnivores, and other snakes. Snakes are especially diverse across Missouri due to the range of habitats available within the state. While Missouri has 49 snake species, only six are venomous. Learning how to identify venomous snakes is important for anyone interested in learning about snakes and those who like to spend time exploring Missouri's natural areas. Our research objective was to determine the most commonly reported venomous snakes in Missouri using community reported data from iNaturalist. We described their life history, habitat needs, and conservation status. Only five species were reported to iNaturalist (i.e. Western Massasauga, Northern Cottonmouth, Timber Rattlesnake, Western Pygmy Rattlesnake, and Eastern Copperhead), while the Eastern Massasauga is likely extirpated from the state. We found that not all venomous snakes have rattles, but they all have elliptical pupils and a sensory pit located between the eye and nostril. The Timber Rattlesnake, Western Pygmy Rattlesnake, and Eastern Copperhead require rocky, forested habitats, while the Western Massasauga and Northern Cottonmouth are found near water sources like moist prairies and swamps, respectively. Of the five species reported, the Western Massasauga is the only species considered critically imperiled due to habitat loss. While venomous snakes can be dangerous to humans, snake bites can be prevented by leaving snakes alone, learning how to identify venomous snakes, and being aware of your surroundings while in nature.

Tarantulas of North America

Presenter: Jurnee Quinones
High School: Lamar High School
Co-authors: Khloey Stringer, Pittsburg State University, Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

Arachnids are a group of highly effective predators that control insect populations, providing ecosystem balance. Tarantulas (Theraphosidae) differ from other spiders due to their larger body size and hunting style. Rather than spinning a web, like true spiders, tarantulas are nocturnal ambush predators that wait and pounce on their prey, using their hairy exoskeleton to detect vibrations of nearby prey. These slow moving, docile creatures are interesting to study due to their differences from true spiders and their global diversity. Our research objective was to identify seven of the most common tarantula species in North America using community reported data from iNaturalist. We described the life history traits, habitat needs, and conservation status of each species. Of the 147 tarantula species reported on iNaturalist in North America, the most commonly reported species were the Texas Brown Tarantula (*Aphonopelma hentzi*; 25% individuals reported), Desert Tarantula (*A. iodius*, 13%), and the Desert Blonde Tarantula (*A. chalcodes*, 10%). All three species are native to southwest United States and northern Mexico; however, the Texas Brown Tarantula has been reported as far north as Illinois and Missouri. Most of the common tarantula species are found in desert or semi-arid habitats, in rocky cavities. Of the seven most commonly reported species to iNaturalist, only the Mexican Pink Tarantula (*Brachypelma klaasi*) is considered near threatened due to urbanization, agricultural expansion, and the illegal pet trade. We encourage people to learn more about the tarantulas living around them so more people recognize their importance to local ecosystems.

Exploring the State Plants of Missouri

Presenter: Alexanderia Rone
High School: Stockton High School
Co-author: Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

In 1893, each state was asked to select a representative flower to display at the Chicago World's Fair. Since then, the state of Missouri has identified a number of plants that represent the state's beauty, diversity of habitats, uses of plants, and cultural heritage. Our research objective was to determine the state plants of Missouri using data provided by Missouri government websites and observation data reported by the community on iNaturalist. We described each state plant, its habitat, distribution across the state, when and why it was chosen as a state plant, and its conservation status. We found data for Missouri's state tree (Flowering Dogwood), flower (Downy Hawthorn), fruit tree (Pawpaw), grass (Big Bluestem), tree nut (Eastern Black Walnut), and grape (Summer Grape). All six plants were reported in iNaturalist across the state; however, some plants were reported less frequently, like the Downy Hawthorn. Many of these plants were named as the state plant due to their abundance in Missouri and each became the plant representative of the state between 1923 and 2007. Our summary of the Missouri state plants is meaningful for the residents of the state to learn more about the plants around them.

Native and Exotic Reptiles of Missouri

Presenters: LeAndra Shotts and Destany Collins
High School: Nevada High School
Co-author: Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

Reptiles serve important roles in many aquatic and terrestrial ecosystems. They function as both predators and prey, control rodent and insect pest populations, and impact nutrient cycling to be overall indicators of environmental health. While native reptiles have evolved along with other species native to Missouri, introduced reptiles have the potential to negatively impact these ecosystem processes and potentially outcompete native species. Our research objective was to identify five common native reptiles and all of the reported exotic reptiles in Missouri, using community reported data from iNaturalist. We described the life history traits, habitat needs, and conservation status of the native species, and included native ranges for the introduced species. We found that 75 species of reptiles inhabit the state of Missouri. Native species ranged from turtles, snakes, and lizards, which can be found in a variety of habitats across the state (e.g., wetlands, rivers, woodlands, etc.). All Missouri introduced reptiles reported on iNaturalist were lizard species: Madagascar Giant Day Gecko, Brown Anole, Flat-tailed House Gecko, Italian Wall Lizard, and Mediterranean Gecko. Many of these species are traded as pets, so they possibly escaped captivity. We want to spread awareness of exotic, introduced reptiles so these populations can be kept in check. People should not release reptile pets into nature, as they can have devastating consequences. Future research should look into how these five exotic lizard species impact the Missouri ecosystem and how they entered the state.

Spotted Spelunkers: Cave Salamanders in Missouri Caves

Presenter: Logan Sinnett
High School: Lamar High School
Co-author: Danielle Evilsizor, Pittsburg State University
Faculty sponsor: Christine Rega-Brodsky, Pittsburg State University

Missouri is a state known for its cave systems, spanning the majority of the southern portion of the state. Caves are rich in animal life, particularly as habitats for species like the cave salamander (*Eurycea lucifuga*). Cave salamanders are a species commonly found throughout habitats with exposed limestone or in rock crevices, bluffs, and caves. Due to their karst habitat associations, we expected to find cave salamanders in areas with greater cave densities. To test this hypothesis, we downloaded cave salamander observation data from iNaturalist, an app in which the community can report sightings of local flora and fauna. We compared cave salamander detections against cave density values across Missouri with a histogram and scatterplot graph. We rejected our hypothesis because we found that cave salamander detections were unrelated to cave density. Instead, detections were a function of their location, typically areas with high human population densities and public lands. Thus, using iNaturalist data was not the best to test this hypothesis, as it relies upon detections reported by app users. Future research on this hypothesis should include

a systematic survey of Missouri caves to determine which habitat features best support cave salamander populations.

The Effects of Synthetic Urine as a Nutrient Solution Substitute in Aeroponic Lettuce Cultivation

Presenter: Noah Burnison
Faculty sponsor: Karisa Boyer
High School: Joplin High School

As environmental challenges intensify and as populations continue to increase, it becomes increasingly paramount to address food and water concerns. It is vital to establish thoroughly tested cultivation practices suitable for harsh environments with limited resources such as manned spaceflight missions, arid biomes, and low-space urban landscapes. Aeroponics, a soilless cultivation method, presents a promising solution due to its ability to optimize resource utilization and minimize environmental impact (Fussy and Papenbrock, 2022). This research sought to enhance lettuce growth efficiency while reducing reliance on traditional nutrient resources by establishing a model for use of human urine as both a method of recycling and fertilization in aeroponic towers. Three trials were conducted yielding data on three different urine-based nutrient solutions. The fresh mass of the lettuce, stem diameter, dimensions and fresh mass of each leaf, and dry weight of the leaves were measured. The data indicated the ideal mineral blend to urine ratio lies closer to 3:1 than to 1:2. It can be assumed that while significant growth may be achieved by replacing half of the nutrient solution, the portion replaced causes nutrient imbalances that may cause greater harm to the lettuce over longer growth periods, and therefore the portion of synthetic urine used should not greatly exceed 1:1.

Various Quantitative Relationships between In-Situ Parameters of a Sample of Quasars and Variables Associated with the Emitted Electromagnetic Radiation of this Sample

Presenter: Christian Wyatt Cavener
Faculty sponsor: Karisa Boyer
High School: Joplin High School

A quasi-stellar radio source, or quasar, is a type of active galactic nucleus (AGN). Quasars are important tools in helping astrophysicists better understand the formation and evolution of galaxies. This project focused on analyzing the data of a sample of quasars contained in Grier et al. 2019 and the Sloan Digital Sky Survey (SDSS) and given by two different mathematical expressions. The goal was to find and briefly discuss various quantitative relationships between two sets of the data: in-situ parameters of the sample of quasars and variables associated with the emitted electromagnetic (EM) radiation of the sample. All of the quantitative relationships in all photometric bands had p-values below 0.05, meaning that all of the quantitative relationships in all photometric bands were statistically significant. Correlation coefficients and absolute values of coefficients of determination were higher and p-values were lower for quantitative relationships between in-situ parameters and spectral flux density than for quantitative relationships between in-situ parameters and magnitude. In-situ parameters were directly correlated with spectral flux

density, and in-situ parameters were inversely correlated with magnitude.

Novel Utilization of Blood Work Monitoring (NavDx) for Early Detection of Cervical and Anal Cancers

Presenter: Caroline Erisman
Faculty Sponsor: Karisa Boyer
High School: Joplin High School

HPV driven oropharyngeal squamous cell carcinoma (OPSCC) linked cancers kill upwards of 40,000 people each year. In order for early detection and treatment to be administered, the NavDx blood test was created to detect OPSCC cancers at the earliest stage, leading to earlier treatment times and better outcomes. Cervical and anal cancers impact upwards of 12,000 people each year, and without early detection, around 4,000 lives are lost each year. By extrapolating this NavDx test to cervical and anal cancers of the same characteristics, it is determined that 96% of these cancers could be treated early. This project examines the efficacy of extrapolating this test to cervical and anal cancers in order to bring about a new efficient testing method for recurring cancers.

Effects of Dominant Microbe on Practical Characteristics of Sourdough Starters

Presenter: Brenden Fain
Faculty sponsor: Karisa Boyer
High School: Joplin High School

Bread has been around for hundreds of years, and up until the 19th century, a fermented starter was the primary method for creating leavened bread. Sourdough starters are made with flour and water, then organisms metabolize nutrients into fermentation products including lactic acid, carbon dioxide, and various organic compounds. With the 19th century innovation of baker's yeast, sourdough has declined in popularity. Minimal effort has been put into understanding the effects certain organisms have on a starter, so this novel study hoped to further our understanding of said effects in hopes of giving bakers greater power over their bread, a power that has thus far been achieved only by brewers with brewer's yeasts.

This was completed by studying the effects of an increased addition of five microorganisms on seven starters' pH and CO2 production. The five microbes were three species of lactic acid bacteria and two species of yeast all chosen for their established presence in the sourdough microbiome (Lactobacillus brevis, Lactobacillus plantarum, Leuconostoc mesenteroides, Candida milleri, and Saccharomyces cerevisiae). The microbes were grown over time from pure cultures received from NRRL, then added to sourdough starter samples to measure pH and CO2 production over time after adding the microbes.

Lactobacillus plantarum had the greatest effect on pH, creating the most acidic starters. Both yeasts appeared to rise faster than any other group. This information coupled with methods for selecting growth of specific microbes opens up a way to alter a bread's characteristics by interfering with the microbiome of its starter.

The Effect of Common Water Bottle Components on the Enzymatic Degradation of Polyethylene Terephthalate

Presenter: Dominic Ortiz
Faculty sponsor: Karisa Boyer
High School: Joplin High School

Enzymatic recycling has shown promise in plastic recycling, and there are many reasons this is a field of research that should be developed, but the main one is to provide a more sustainable future for humanity. While there are many aspects of enzymatic recycling that need to be finalized, this project points out potential contaminants' effect on the enzyme substrate reaction. A polyethylene terephthalate enzyme or PETase found in Ideonella sakaiensis 201-F6 was used as the model enzyme. Weight measurements before and after incubation and pH measurements during the experiment were taken to determine the degradation of the plastic. Both the pH and weight measurements supported the conclusion that the degradation was improved in the presence of the contaminants.

The Effect of Oral Contraceptives on the Prevalence/Incidence of Ovarian Cancer

Presenter: Lily Smith
Faculty sponsor: Karisa Boyer
High School: Joplin High School

Ovarian cancer is the fourth most common cause of female cancer death in the developed world. In the US alone, 14,000 women die from this condition every year (Jayson et al., 2014). The use of oral contraceptives has been shown to reduce ovarian cancer risk by 40–50% (Royar et al., 2001). Oral contraceptive pills are the most commonly prescribed form of contraception in the US. There are two types of oral contraceptive pills: combined estrogen-progesterone and progesterone-only pill (Cooper et al., 2022). The protective effect of a progesterone-only versus a combined oral contraceptive pill on the prevalence/incidence of ovarian cancer was determined in this novel experiment with the use of 10 cohort studies to gather data. Data along with risk of bias factor information were collected and sorted in a spreadsheet. All data were analyzed using Cochrane RevMan software. This study showed that the vast majority of clinical information supports that combined oral contraceptives are protective from the prevalence/incidence of ovarian cancer ($p < 0.00001$).

Microplastics in Bottled Water

Presenter: Talha Agha
Faculty sponsor: Sara Capra
High School: Park Hill High School

Microplastics in bottled water have been an on the rise topic in recent years with the consumption of bottled water skyrocketing. The evergrowing rise in popularity of conventional plastic water bottles has taken over, with on average more than 1.3 billion bottles used each day. In this paper,

my research tackles whether there is a possible correlation between bottle design of plastic water bottles and their concentration of microplastics within them. Data was collected by image-analysis gathered through the combined testing using both staining with Nile Red (NR) and an agarose solution. These results were then analyzed through a laser microscope through Stowers Institute. Results demonstrated that the four brands of bottled water tested had a mixed variety of microplastics, but demonstrated no correlation to the experimental question of whether a correlation exists between bottle design and microplastic concentration.

Nanoparticle Drug Delivery Systems: A Review of Toxicity and Biodistribution within Healthy Tissue

Presenter: Adam Ampon
Faculty sponsor: Sara Capra
High School: Park Hill High School

While standard cancer treatments like chemotherapy are used to battle aggressive forms of cancer, their limited effectiveness prevents successful eradication of tumors including the inducement of harm to the patients themselves caused by inefficient chemotherapeutic drugs and unintended uptake of drugs by human organs. Furthermore, nanoparticle drug delivery systems create an avenue for more beneficial applications of standard chemotherapeutic treatment. This research paper aims to review and analyze the use of platinum, gold, mesoporous silica, liposome, iron-oxide, polymer, and lipid-based nanoparticle delivery systems, known for their biocompatibility and effectiveness of drug delivery, and their effects in reducing toxicity and biodistribution of organ accumulation. While all seven nanoparticles differ in modification, composition, and application depending on approaches made by researchers analyzed for this paper, large implications are leaning toward size, concentration, and dose-dependent trends regarding toxicity and biodistribution. Analysis of 30 articles reveals trends of greater toxicity and distribution of nanoparticles ranging from 5 nm up to 60 nm in size, however, some nanoparticles such as liposomes and MSNs were optimized at different sizes due to their pharmachemistry. Concentration-dependant and dosage-dependant effects take on different observations due to the difference in modification and approaches made by researchers, however, the liver, spleen, and kidneys, all major organs within the reticuloendothelial (RES) system, seem to receive the majority of the accumulation of nanoparticles compared to other organs during *in vivo* and *in vitro*.

How Different Social Settings Allow People to Believe Bias in Literature

Presenter: Colin Kavanaugh
Faculty sponsor: Sara Capra
High School: Park Hill High School

This paper aims to investigate the effects of different levels of social settings affecting the bias we perceive to see in different pieces of literature displayed upon news media. Through thoroughly analyzing the available literature, the specific effects that each level of social setting has on bias to be believed in literature is examined in this study. Additionally, lack of pre-existing studies on the specific age gap, the topic selected and pre-existing opinions is addressed as this research project's goal is to fill a gap in the literature. Students at Park Hill High School were surveyed

using scales from 1 to 10, 5 being unbiased. And their levels of communication, being the ability to talk between group members, was also surveyed on their experience with the bias they believed was presented. It was concluded that there were links found with the kind of Social setting that a student was presented with was tied to how much they believed the bias to be presented. As in solo settings they had critiqued their own previous beliefs, believing that the articles that were thought to be more agree with were actually opposed. Furthermore, in group settings they had adopted something against the other side. Believing that, with similar numbers, the article that they had opposed was extremely biased against their agenda.r

Cybersickness in a Virtual Environment

Presenter: Raphael Relaina
Faculty sponsor: Sara Capra
High School: Park Hill High School

The use of virtual reality training has been increasing among athletes and coaches to train in ways that weren't possible with previous technology. A major hindrance to this is cybersickness, and although there are several studies in this field, it is not well understood. This is especially true when it comes to predictors that may induce cybersickness levels. Given we know that athletes are less susceptible to motion sickness than non-athletes, this paper discusses whether or not different workloads within virtual reality affect the levels of cybersickness between non-athletes and athletes in an age group of high school students by performing an experimental quantitative research study on participants in a virtual reality environment. 8 participants (4 athletes and 4 non-athletes) were exposed to an HMD with hand controllers in a virtual environment. Participants were administered a Pre-Simulator Sickness Questionnaire(Pre-SSQ). Participants then entered the game Tilt Brush and Windlands 2, for 5-10 minutes each session. Participants were administered a Post-SSQ between both sessions. The research shows that there is a correlation between athleticism and task workload on participant's level cybersickness, with athletes scoring lower average scores on the SSQ as compared to those of non-athletes.

2024 PSU Research Colloquium Award Winners

Category	Type	Position	Author(s)	Title	Sponsoring Faculty
A	Poster UG	1	Cassie Wheeler & Erin Hammeke	Addition of phthalimide to styrene oxide using ammonium salts as catalysts	Dr. Neef
A	Poster UG	2	Gage Rosetti, Eric Chelgren, Sawyer Patrick, & Jordan Thomas	Installation of Rocheleau Blow Molder in the Department of Plastics Engineering Technology at PSU	Drs. Herring and Norton
A	Poster UG	2	Emma Springer, Brady Franklin, Zach Coenen, Jacob Shuler, & Grant Howard	Study of Post-Industrial and Post-Consumer Plastics for Degradation Behavior and Material Properties	Dr, Norton
A	Poster GR	1	Mayankkumar Chaudhary, Pratik Patel, & Rutu Patel	Castor Oil-based Polyurethane Adhesives: Effect of Cross-Linker on the Bond Strength	Dr. Gupta
A	Poster GR	2	Sonu Parek, Mayank Chaudhary, Rutu Patel, Pratik Patel	Soybean Oil-based Adhesives: Effect of Aliphatic Diols on the Properties of Adhesives	Dr. Gupta
A	Poster GR	3	Robert Cordova & Marlon Williams	Biofeedback Assisted Self-Monitoring to Reduce Blood Glucose Levels in Sedentary Adults with Obesity	Drs. Speelman & Ragland
A	Poster GR	3	Adam Mortensen	Low socioeconomic status negatively impacts field-test battery in college aged women	Dr. Ragland
A	Poster GR	HM	Grant Howard, Emma Springer, Megan Walser, Paul Herring, & Dan Spielbusch	Development of Circularity-focused Plastics Laboratory Activities at Pittsburg State University	Dr. Norton
A	Poster GR	HM	Saiprasanna Neerukonda	Biobased Vitrimers via Melt-Polycondensation	Dr. Gupta

				Process with Good Extensibility, Reprocessability, and Self-Healable Properties	
A	Poster GR	HM	Rutu Patel, Pratik Patel, Mayankkumar Chaudhary	Fluorine-Free, Bio-based Antismudge Polyurethane Coating with Enhanced Flame Retardancy	Dr. Gupta
A	Oral UG	1	Leanne Trout	How to train your opossum: Captive Virginia opossum (Didelphis virginiana) responds to the color red after positive reinforcement training	Dr. Lister & Dr. Brodsky
A	Oral UG	2	Khloey Stringer	The Cat's Out of the Bag: Comparing the Presence of Bobcats and Domestic Cats Across Land Cover Types in Kansas	Dr. Brodsky
A	Oral UG	3	Renee Trout	Introduction of a novel food resource and obstacle are promising enrichment tools for the captive prairie kingsnake (Lampropeltis calligaste)	Dr. Lister & Dr. Brodsky
A	Oral G	1	Joshua Holloway	Spatiotemporal Changes in the Imperiled and Diverse Mussel Assemblage of the Spring River in Response to Known and Emerging Pollutants	Dr. Whitney
A	Virtual UG	1	Alyssa Tyler	Comparison of County and City Law Enforcement Agencies Responsibilities and its Effects on its Community Relationships	
A	Virtual G	1	Justin Cope	The effect of education path and nursing specialty on Knowledge	Drs. Heter, McClaskey, Belcher

				and Attitude Survey Regarding Pain scores	
B	Poster UG	1	Ty Scharff	The Populist Movement in late nineteenth century America	Dr. Thompson
B	Oral UG	1	Caden Hughes	The Determinants of Housing Prices in Micropolitan Areas	Dr. Davidsson
B	Oral UG	2	Andersen Meek	Determinants of Crime	Dr. Davidsson
B	Oral UG	2	Tricia Combs	Consumer Education of Fast Fashion	Dr. Jason
B	Oral UG	HM	Maleah Poole	Affordability Timeline in Kansas: Change in Home Prices and Income in the 2000s	Dr. Davidsson
B	Oral UG	HM	Chance Turley	Ballot Box Belonging: What Truly Defines American Citizenship?	Dr. Thompson
B	Virtual GR	1	Megan Vestal	Guided Inquiry Design Lesson: Claim to Fame – Biographies and Facts	Dr. Mascher
C	Virtual GR	1	Priyank Patel	Rubber Seed Oil-Based UV-Curable Polyurethane Acrylate Resins for Digital Light Processing (DLP) 3D Printing	Dr. Gupta
D	Poster UG	1	Alice Henisey	Emergency Room Mental Health Services: Can We Do Better?	Dr. McClaskey
D	Poster UG	2	Leah Scott	Current Amount of Postpartum Care: Is It Effective?	Dr. McClaskey
D	Poster GR	1	Fnu Himanshi	Amorphous Phosphorus-Incorporated Cobalt Molybdenum Sulphide on Carbon Cloth: An Efficient and Stable Electrocatalyst for Enhanced Overall Water Splitting over Entire pH Values	Dr. Gupta

D	Poster GR	2	Smit Chaudhary	The Synergistic Effect of Ionic Liquid-Modified Expandable Graphite and Intumescent Flame-Retardant on Flame-Retardant Rigid Polyurethane Foams.	Dr. Gupta
D	Poster GR	2	Fenil Patel	Bioinspired Natural Magnolol-Based Adhesive with Strong Adhesion and Antibacterial Properties for Application in Wet and Dry Environments	Dr. Gupta
D	Poster GR	HM	Janvi Chaudhari	Bioinspired Natural Magnolol-Based Adhesive with Strong Adhesion and Antibacterial Properties for Application in Wet and Dry Environments	Dr. Gupta
D	Poster GR	HM	Lav Sharma	Biobased polyester composites with improved antibacterial characteristics are made by integrating a thermally treated waste scallop shell modifier	Dr. Gupta
D	Virtual GR	1	Rhonda D'Agostino	Increasing Student and NP Faculty Satisfaction Using Simulation: A Literature Review	Dr. Harris
E	HS	1	Christian Cavener	Various Quantitative Relationships between In-Situ Parameters of a Sample of Quasars and Variables Associated with the Emitted Electromagnetic Radiation of this Sample	Karisa Boyer – Joplin HS
E	HS	2	Chung Awr, Raina Bartlett, Jonathan Heck,	Effectiveness vs Cost Efficiency of Denser Protein Feed	Kylie Hackworth – Upward

			& Quentin Pierce		Bound Math & Science Program: Crowder College
E	HS	3	Adam Ampon	Nanoparticle Drug Delivery Systems: A Review of Toxicity and Biodistribution within Healthy Tissue	Sara Capra – Park Hill HS
E	HS	3	Noah Burnison	The Effects of Synthetic Urine as a Nutrient Solution Substitute in Aeroponic Lettuce Cultivation	Karisa Boyer – Joplin HS
E	HS	3	Caroline Erisman	Novel Utilization of Blood Work Monitoring (NavDx) for Early Detection of Cervical and Anal Cancers	Karisa Boyer – Joplin HS
E	HS	3	Lily Smith	The Effect of Oral Contraceptives on the Prevalence/Incidence of Ovarian Cancer	Karisa Boyer – Joplin HS