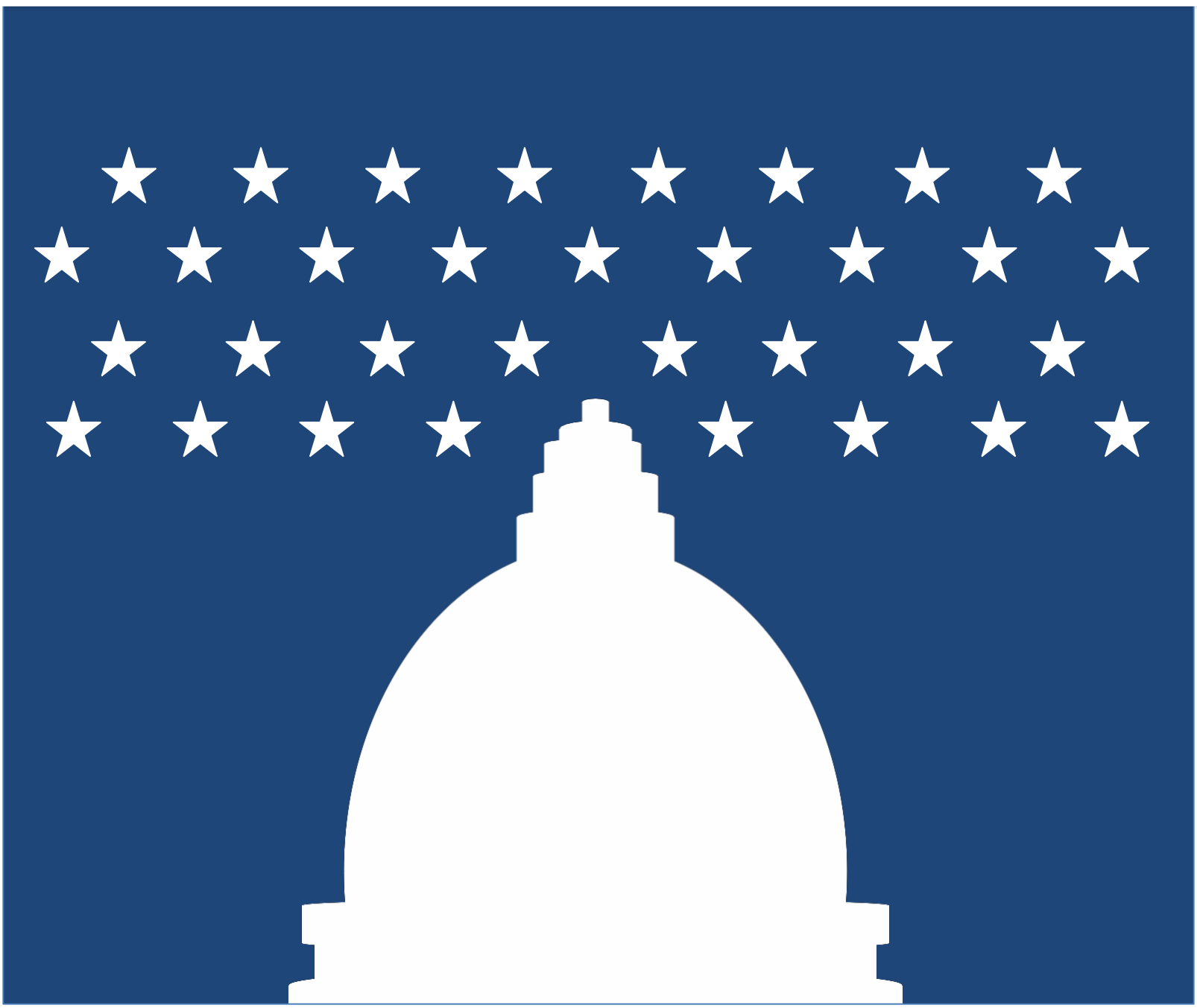
Kansas Undergraduate Research Days 2021



KANSAS BOARD OF REGENTS

Kansas Undergraduate Research Day at the Capitol

The Kansas Board of Regents is pleased to support the outstanding students selected to present at the 2021 Kansas Undergraduate Research Day. University research has propelled the United States into a world leader in the development of new technologies as well as advancements in existing technologies. Students selected for this event are conducting research that matters to the citizens of our great state.

The role of undergraduate students in research is vital in developing products that will shape our future.

These students learn skills that prepare them for the workforce while promoting engaged learning both inside and outside the classroom. Undergraduate student researchers complete projects that benefit their personal growth, expand knowledge in a variety of fields, and contribute to the growth of the state's economy. The talent of these students and their mentors is remarkable.

The Kansas Board of Regents invites you to explore the research selected for presentation today from Emporia State University, Fort Hays State University, Kansas State University, Pittsburg State University, The University of Kansas, Washburn University, and Wichita State University.

We are confident you will leave the event committed to continue supporting research that benefits our students and our state and in awe of the outstanding work of these students.

Shane Bangerter
Chair, Kansas Board of Regents

Blake Flanders
President and CEO, Kansas Board of Regents

Kansas Undergraduate Research Day

March 2, 3 & 4, 2021

Participating Kansas Board of Regents Institutions:

Emporia State University

Fort Hays State University

Kansas State University

Pittsburg State University

The University of Kansas, Lawrence Campus

The University of Kansas, Medical Center

Washburn University

Wichita State University

Emporia State University

Student: **Kolton Hall**
Year: Senior
Department: Accounting
Mentor: Dr. Joyce Zhou
Title: Limited Memory Artificial Intelligence Potential in Autonomous Class A, B, C Motor Vehicles Operating for Top Tier Shipping Companies

Artificial Intelligence (AI) is a branch of computer sciences that put emphasis on the development of intelligence pertaining to machines which think and work just as a human though have extensive limitless artificial cognitive abilities. Autonomous vehicles feature limited memory artificial intelligence, making them able to successfully maneuver around obstacles and operate responsibly just as a motor vehicle with a human controlling occupant may do. The purpose of this study is to determine the feasibility of implementing Limited Memory Artificial Intelligence in autonomous vehicles of varying class sizes to enhance the efficiency of package delivery for top tier shipping companies FedEx and UPS. A deep understanding of Artificial Intelligence specifically with regards to Limited Memory Intelligence will be explored. Secondary research will be conducted to further advance the understanding as well as overall knowledge arsenal pertaining to autonomous vehicles used to facilitate package transport by top tier shipping companies. The data obtained will be subject to certain criteria with regards to information processing and will be analyzed by means of graphical representation. Research is still in progress. A conclusion is aimed to be formed by our findings that will either validate why artificial intelligence should take over the task of shipping packages or disprove the practicality of such a concept in the first place.

Kolton Hall is a Senior at Emporia State University pursing a Bachelor of Science in Accounting and Marketing. He is from Virgil, KS and finds enjoyment in advancing his knowledge in sales and ability as an entrepreneur. Research for this project is classified as secondary research to examine the feasibility for top tier shipping companies such as FedEx and UPS to implement this type of AI, Artificial Intelligence into their delivery vehicles forming a fully autonomous motor vehicle. Dr. Joyce Zhou is his mentor and partner for this project. After graduating, he intends to earn his Master of Business Administration with a concentration in Marketing before pursuing his goal of becoming a PhD and eventually Professor of Economics or Marketing.

Student: **Shelby Innes**
Year: Senior
Department: Physical Sciences
Mentor: Dr. Luthi Andrea
Title: Towards Peptide-polymer Nanoparticles of Different Charges for Studying Biological Interactions

Peptide-polymer amphiphiles (PPAs) are tailorable polymers that can be formulated into nanoparticles with different biological properties. The peptide used in this nanoparticle, will be a mimetic peptide of high-density lipoproteins. These types of nanoparticles have various biomedical applications such as being used as therapeutics and drug delivery vehicles. In addition to developing new ways of using peptide-polymer nanoparticles to treat diseases, it is important to study the biological interactions between these nanoparticles and biological systems. The goal of this research project is to synthesize

PPAs with a negative, positive, or zwitterionic charge and formulate them into peptide-polymer nanoparticles with different surface charges. Then, the effect of surface charge on the biological interactions of the nanoparticles with biological systems will be studied. The polymers were synthesized using a phenyl monomer, which will form the core of the nanoparticle, by ring-opening metathesis polymerization. A modified Grubbs second generation catalyst was used for the polymerization. Different sizes of polymers were made to check for control of polymerization. The polymers were analyzed using gel permeation chromatography. The phenyl monomer, Grubbs second generation catalyst, and phenyl polymers have all been successfully synthesized. The rate of polymerization shows some promise in being controlled.

Shelby Innes is a senior at Emporia State University pursuing a degree in Biochemistry and Molecular Biology with a minor in Psychology. Shelby is from Olathe, KS but spent her childhood growing up in Madison, WI. At ESU, Shelby has been involved in an undergraduate research project, working as a TA and chemistry tutor, and being a member of the volleyball team. After graduation, Shelby plans to pursue a Masters' degree in Biochemistry or Biology.

Student: **Genevieve Lowery**
Year: Senior
Department: Communication & Theatre
Mentor: Dr. Jasmine Linabary
Title: Digital Community Organizing in Covid-19

Digital community organizing is a term that describes a group of people who organize themselves by digital means (including social media, email, texting, video calls, etc.) in order to act and make an impact in their local community. This impact may be seen in several different forms such as political or social change, community service, advocacy, and other ways of making a local difference. Our study focuses on identifying the processes of digital community organizers who have worked in the midst of the pandemic. It explores what communication practices helped teams to succeed in achieving their goals and what practices may have hindered them. To date, the primary research method used has been interviews conducted by the researcher. The researcher has conducted semi-structured qualitative interviews by phone, email, or virtually on whatever platform the participant is most comfortable. Interviews last an average of 30 to 60 minutes and are recorded through audio-recording and note-taking with the participants' consent. Recordings are then transcribed for analysis. Through our analysis, we hope our study will provide knowledge of best practices for digital community organizing that can inform and aid the success of current and future teams in this area.

Genevieve Lowery is a senior at Emporia State University studying Communication and Spanish. She has served as an officer for both ESU's Christian Challenge and Spanish Honor Society. She is a co-founder of Bag-A-Birthday, which provided birthday party supplies for low-income children in Emporia and won ESU's 2019 Community Impact Challenge. Lowery has gone on thirteen mission trips to Mexico since 2016 where she has organized events, led teams, and served as an interpreter to assist children and families at the border. She was also a leader in Never Too Young, a digital community organizing group that provided meals during COVID-19. After graduation, she hopes to spend a year traveling, practicing languages, and gaining experience as a leader and community organizer before attending graduate school.

Student: **Michael Stump**
Year: Senior
Department: Physical Sciences
Mentor: Dr. Qiyang Zhang
Title: Reactions of Lysergic Acid Amide and Cinnamaldehyde: Synthesis, Analysis, and Applications

Lysergic acid amide (LSA) derivatives are a class of bioactive molecules that exhibit profound psychoactivity and unique neurological effects. One lysergic acid carbinolamide has been characterized in the literature, the naturally occurring lysergic acid hydroxyethylamide, (LSH). Produced by parasitic and endophytic species of ergot fungi, LSH exhibits profound psychedelic effects in humans. LSH is commonly considered an adduct of LSA and acetaldehyde, resulting in the hypothesis that synthetic combination of LSA with other aldehydes will produce a new class of bioactive lysergamides. This study evaluates reactivity of LSA and cinnamaldehyde in catalyzed and uncatalyzed conditions. The carbinolamide catalyst dicyclohexylchloroborane, (Cy2BCl) was synthesized to develop a viable workup to the LSC's. Products were analyzed using standard analytical techniques. Research is still in progress. Purification of naturally sourced LSA has been streamlined, and the two experimental reactions are scheduled for February 2021.

Michael is a senior at Emporia University majoring in Chemistry with a minor in Physics. He was born and raised in Emporia, KS. During his time as an undergraduate student at Emporia State, he served as the president of the American Chemical Society Student Chemistry Club for two terms. He began planning his research in the summer of 2019 and began work in the spring of 2020 with his advisor Dr. Qiyang Zhang. After graduation, Michael plans to pursue a PhD in Chemistry, and hopes to expand this project for his Doctoral Dissertation.

Student: **Tania Wiest**
Year: Senior
Department: Biological Sciences
Mentor: Dr. Joanna Gress
Title: RT-qPCR Analysis of Antioxidant Gene Regulation of Apis mellifera in Response to Coumaphos, Imidacloprid, and Cannabidiol

Cannabidiol (CBD) is one of the main pharmacologically active phytocannabinoids of Cannabis sativa L. and exerts antioxidant properties. CBD may have protective antioxidant effects against the insecticides imidacloprid, a neonicotinoid and coumaphos, an organophosphate in Apis mellifera. Previous studies have shown that ingestion of these insecticides causes a downregulation in antioxidant genes in the gut tissue. The main objective of this study was to test comparatively the effects of CBD and these two common insecticides on honeybee worker's lifespan, mortality, and expression of antioxidant genes. To evaluate the effects of CBD on antioxidant gene expression in the gut we exposed foraging bees to six solutions of 1 M sucrose containing 10nmol of each chemical: sugar control, imidacloprid, coumaphos, cannabidiol, coumaphos + cannabidiol, and imidacloprid + cannabidiol. 10 nmol of each chemical were added in each instance. After observing behavioral response to the treatment, we extracted RNA from their abdomens, and used RT-qPCR to assess 10 bee antioxidant genes linked to pesticide toxicity. CBD caused significant upregulation of SOD 1 & 2 genes when combines with coumaphos. CBD also caused significant upregulation of six out of the ten antioxidant genes studied when combined with imidacloprid.

Tania Wiest grew up in Lawrence, Kansas and is a senior at Emporia State University majoring in biology with a concentration in botany and a minor in chemistry. In the Spring of 2020, she started her current work on honeybees with Dr. Joanna Gress. In January 2021, this research was selected to be presented orally at the 19th annual K-INBRE symposium, and she was awarded an honorable mention. She also volunteers with the Emporia State's "Emporia At the Table" initiative to combat food insecurity on campus and in the greater Emporia community, and is a member of the university's Honors College. After graduating in Spring 2022, she plans on continuing her education studying plant genetics and agronomy.

Fort Hays State University

Student: **Abigail Hayes**
Year: Junior
Department: Criminal Justice
Mentor: Dr. Tamara Lynn
Title: Effectiveness of Drug Abuse Treatments in Prison

Treatment programs in prison for drug abuse are becoming important in making a positive difference if the program is effective enough. There is a group of great programs out there that are changing inmates' lives and helping them be healthier and not re-offend. These programs are helping these inmates with their drug addiction and helping them become clean. Along with the positive programs in prisons, there are also the ones that do not work out as well in the prison. These are the programs that are either not being enforced well or the people running them are not trained to do so. Another possibility is that the program itself is not structured well or it could be not as effective. Within the last few years, there has been a spike in research about drug treatment programs to see what is actually working and what is not. With prison overcrowding, researchers are trying to find programs to keep people from going to prison or re-offending. Based on what the researchers have conducted they found that the most effective types of treatment are programs where they have multiple aspects mixed into one program. There are treatment plans that could involve group therapy, interventions, workbooks, or any other kind of treatment. This research is being used around the world and it can have a positive impact in Kansas prisons. This paper will go more in detail about these programs that the researchers have tested, and what is not working in the corrections system.

My name is Abigail Hayes, and I am a junior at Fort Hays State University majoring in Criminal Justice. I was born and raised in Baldwin City, Kansas. Growing up there taught me a strong work ethic and the value of integrity and respect. I graduated from Baldwin City high school in May 2018 and decided to continue my education in the Fall of 2018 at Fort Hays State. Criminal justice has always been of interest to me as I look forward to a rewarding career of helping others.

Student: **Cristina Jimenez**
Year: Senior
Department: Criminal Justice
Mentor: Dr. Ziwei Qi
Title: An Overall Review on Domestic Violence and Criminal Justice Response in Rural Areas

Introduction: Victims of domestic violence in rural areas face complex and unique challenges in accessing rural service providers and justice-based agencies. To effectively respond to domestic violence, law enforcement agencies should utilize consistent and trauma-informed practices.
Purpose: Effective responses to domestic violence incidents from law enforcement are essential to achieving various positive outcomes, including ensuring both the victims' and children's safety, the successful prosecution of the perpetrators, and the increased probability of ending the cycle of violence.
Methods: The researcher will provide a comprehensive literature review and policy analysis on domestic violence in rural areas, the challenges victims face when accessing services and reporting incidences of

abuse, issues with the legislation, and law enforcement response to domestic violence. Future policy recommendations will also be discussed in the research.
Findings: Police agencies should provide resources to further officer training and agency specialization, recruit officers in diverse backgrounds, disengage personal ties with abusers, and reexamine the patriarchal attitudes and beliefs towards domestic violence. Lawmakers and law enforcement should reconsider legal statutes that deter victims from reporting crimes, such as legislation on mandatory arrest, failure to protect, and parental kidnapping policies.

Cristina Jimenez is a senior at Fort Hays State University (FHSU) with a bachelor's degree in Criminal Justice and certificates in Criminological Theory and Victim Advocacy. She is also a research assistant at the Center for Empowering Victims of Gender-based Violence (CEVGV) at FHSU and engaging in research/service activities addressing the causes of domestic violence and the survivors' needs in rural communities. She is a member of the FHSU Criminal Justice Club, the FHSU Honor Society, and the American Criminal Justice Association. Upon completing her undergraduate studies, she intends to apply to law school to further her education within the criminal justice system and advance her position as a domestic violence advocate.

Student: **Mallory Benortham**
Year: Senior
Department: Psychology
Mentor: Dr. Carol Patrick
Title: COVID-19, Sex, and Self / Community Protection

There is little information about sexuality and COVID-19 and whether sexual behavior has changed after the COVID-19 pandemic started. This study examines the changes in sexual practices before and after COVID-19 onset in mid-March 2020, and whether college students are taking more precautions to prevent the spread of the disease. Changes in rate of sexual activities and use of protection (condoms) pre- and post-COVID will be examined, as well as factors that may relate to changes in sexual activity and protected sex, including: 1) mask wearing and social distancing (and how that relates to sexual protection used); 2) general risk-taking as a trait; 3) stress about the pandemic; 4) tendency to have problems regulating emotions and inhibiting behavior during times of stress; and 5) stance on the importance of individual rights versus acting for the collective good in pandemic protection. Terror management theory, which suggests that when facing times of possible mortality, people cling more tightly and extremely to their personal belief systems, will also be examined as a factor in self and other-protective behavior during the pandemic. Data is currently being gathered.

My name is Mallory Benortham and I am a senior currently attending Fort Hays State University. When I graduate from Fort Hays State University, I will have a bachelor's degree in biology with an emphasis on health professions, a minor in chemistry and a minor in psychology. After graduating I have the hopes of attending Physician Assistant school. Psychology and especially human sexuality have always been something that has interested me. That is why I feel so honored to be able to be a part of this research study with Dr. Carol Patrick.

Student: **Grace Wasinger**
Year: Senior
Department: Psychology
Mentor: Ms Brooke Mann
Title: Engaging with Constituents on Twitter: How Source Credibility and Formality of Language Interact to Influence Public Perception

Introduction: In recent years, Twitter, a micro-blogging social network, has been a platform for receiving breaking news, with 71% of Twitter users utilizing the site to receive daily news (Shearer & Grieco, 2019). Twitter engagement has progressed in recent years through its trend of professional accounts engaging with the public about breaking news.
Purpose: Because of the influx of breaking news available on mobile devices, it is imperative that individuals understand how various sources and formality of language may influence the public. Moreover, this research attempts to fill a gap in the literature concerning user perception on Twitter.
Methods: A 2(language style: informal or formal) x 2(Source: personal or professional account) between-subjects design was used to look at the aforementioned research question. Participants read a vignette that outlined a news story covering the Israel-Palestine peace plan. Participants then viewed a Twitter feed. One hundred and thirty-six participants were recruited from Amazon's Mechanical Turk.
Findings: A series of one-way ANOVAs showed a difference in perception based on language used, $F(3, 130)= 8.07$, $p= .000$, level of perceived intelligence, $F(3, 130)= 3.40$, $p= .02$, how real/fake the source appeared, $F(3, 130)= 4.14$, $p= .008$, and source's level of informed on the topic, $F(3, 130)= 3.06$, $p= .031$.

Grace Wasinger is a senior at Fort Hays State University (FHSU). In May of 2021, Grace will graduate with a Bachelor of Science in Psychology. Grace has engaged in active research since her freshman year of studies at FHSU, attending numerous conferences, such as the Association for Psychological Science (APS) and the Southwestern Psychological Association (SWPA). During her undergraduate studies, Grace has been a part of research labs working both independently and collaboratively on topics related to social cognition, decision making, and social networks. Grace is currently a member of the Mindfulness and Attention Research Studies (MARS) laboratory and the treasurer of the Psychology Club. Upon completion of her degree at FHSU, she plans to pursue graduate studies in Psychology.

Kansas State University

Student: **Victoria de Souza**
Year: Senior
Department: Anatomy and Physiology
Mentor: Dr. Meena Kumari
Title: Delineating effects of *Cannabis* on the human brain: Part 1 – Characterization of human astrocytes

Cannabis sativa plant produces several phytocannabinoids including psychoactive Δ^9-tetrahydrocannabinol (THC) and non-psychedelic cannabidiol (CBD). *Cannabis* has a long-standing history of its use in medicine and religion. Today cannabis is the most widely used illicit drug and has over 180 million adult users (UNODC 2015), a number that rising continuously. Currently, 46 U.S. states have decriminalized and/or legalized the use of cannabis or cannabis-derived compounds for medical and/or recreational purposes. There is some evidence that long-term use of cannabis/THC impacts the central nervous system in humans. THC decreases the structural and functional integrity of several brain regions with profound effects on cognition and affective behaviors. It is critical to understand the mechanisms of THC/cannabis on the brain. The endocannabinoid system consists of cannabinoid receptors (CB1R and CB2R) and ligands anandamide and 2-arachidonoylglycerol. THC acts on the brain by binding to CB1R. THC binding to CB1R on astrocytes results in modulation of neuronal excitability. Our goal is to understand the role of astrocytes in mediating the effects of THC on the integrity of the brain. We cultured and characterized commercially available human astrocytes. Our data demonstrated that all cells were positive for GFAP, a marker protein for astrocytes. Expression of CB1R was seen at the cell surface and in the cytoplasm in human astrocytes. Western blotting identified 46 kDa protein in astrocyte extracts. These data were confirmed by amplifying CB1R mRNA by qPCR. The initial characterization of human astrocytes suggests that these cells are a good model system to examine the effects of THC on the human brain. Results of cannabis research at K-State can provide guidance to Kansas Lawmakers to make appropriate decision(s) to implement the use of THC/cannabis for medical and recreational purposes in the state of Kansas.

Victoria de Souza is a senior at Kansas State University. She is pursuing a bachelor's degree in biology, with a focus on human health biology and following a pre-physician assistant path. She is originally from Brasilia, Brazil, and have been permanently living in Manhattan, Kansas for the last 3 years. At Kansas State University, she is involved with multiple organizations that have allowed her to take on leadership roles on campus. These include the Hispanic American Leadership Organization, Latinas Unidas Poderosas y Educadas, and WellCat Ambassadors. Moreover, her participation in the Developing Scholars Program has immersed her in research in neuroscience within the Department of Anatomy and Physiology.

Student: **Rachel Kort**
Year: Senior
Department: Grain Science and Industry
Mentor: Dr. Chad Paulk
Title: Effects of decreasing corn particle size on metabolizable energy and proportions of fecal volatile fatty acids in gestating sows.

Previous research has demonstrated that for every 100 µm reduction in grain particle size finishing pig feed efficiency is improved 1.0 to 1.3%. This improvement results from an increase in the concentration of metabolizable energy (ME) in corn. However, limited data is available on the effects of corn particle

size when fed to gestating sows. The objective was to determine the effects of corn particle size on the ME and molar proportions volatile fatty acids (VFA) in the feces of gestating sows. A total of 27 sows (Line 241; DNA) were fed a common diet manufactured with corn ground to one of 3 target particle sizes (dgw): 400, 800, or 1200 µm. Sows were fed experimental diets for 7 days to allow for diet adaptation before a 2-day collection period of urine and fecal samples. On day-82 and 83 of gestation, 2 fecal grab samples were collected for VFA analyses. Reducing dgw of corn from 1,200 to 400 µm increased (linear, P<0.01) diet ME, AMEn and calculated ME of corn. Sows fed diets with decreasing corn dgw had increased (quadratic, P=0.021) fecal acetic acid proportions, and decreased propionic (quadratic, P =0.019) and valeric acid (=0.005). In conclusion, for every 100 µm decrease in corn dgw from 1,200 to 400 µm, corn ME value increased by 28.6 kcal/kg. Swine producers across the state of Kansas can use this information to account for energy differences in corn-based on corn dgw to properly formulate diets.

Rachel Kort is a senior at Kansas State University majoring in Feed Science and Management/ Pre-Vet. She is originally from Ayr, Nebraska where she grew up on her family farm and was heavily involved in the livestock industry. For the past three years, she has been a member of the Feed Safety Research Team at K-State. With this, she had the opportunity to conduct her own research projects and assist graduate students with their projects. She competed in research competitions at the 2019 and 2020 International Production & Processing Expos and the 2020 Midwest Section- American Society of Animal Science (ASAS). She was awarded 3rd place in the Undergraduate Research Poster at the ASAS Meeting. She looks forward to utilizing what she has learned from undergraduate research as she begins her journey in veterinary medicine.

Student: **Lindy Maska**
Year: Senior
Department: Applied Human Sciences
Mentor: Dr. Anthony Ferraro
Title: Identifying Assessment Tools of Child-centered Communication for the Development and Evaluation of Divorce Education Programs.

Within the United States, divorce education programs exist to enhance the ability of separating parents to coparent effectively, in the interest of facilitating their children's adjustment to the divorce. Divorce proceedings are a national concern with standards varying drastically across states and local jurisdictions, which has led to the development of an eclectic set of programs across the United States (Ferraro et al., 2016). Despite this, Schramm et al. (2018) identified that there exists a common core of concepts and issues that are covered in many of these programs. The purpose of this research was to identify and assess tools available to divorce education program facilitators, in the interest of maximizing the benefits and standardizing assessment across programs. A systematic review was conducted, using predetermined search terms within four academic databases to identify measures related to eight child-centered communication constructs (see Schramm et al., 2018). All relevant sources were identified and reviewed for additional information, such as reliability and validity. Following a comprehensive review of the measures, 11 scales were determined to adequately measure at least one of the eight child-centered communication constructs. In the state of Kansas, the mandate for divorce education is flexible with the assortment of divorce education classes offered varying in scope and purpose. The identified measures could be used to homogenize evaluation efforts of divorce education programming across Kansas. Further, an alignment in this way could collaborate with national evaluation efforts to better understand effective outcomes for parents that complete divorce education courses.

Lindy Maska is a senior at Kansas State University who grew up in Gardner, Kansas, and graduated from Gardner-Edgerton High School. Now, she is preparing to graduate in May with a Bachelor of Science in Human Development and Family Sciences, as well as minors in Biology, Conflict Analysis and Trauma Studies, and French. After graduation, she hopes to continue her education to earn a Master's degree in Genetic Counseling. Looking to gain insight into families in states of transition, she began working with Dr. Anthony Ferraro's Families in Transition Lab in June of 2019 and is excited to share the work that the team has been doing identifying tools available to divorce education program facilitators.

Student: **Kourtney Rumback**
Year: Senior
Department: Psychological Sciences
Mentor: Dr. Kimberly Kirkpatrick
Title: The behavioral and neuroinflammatory consequences of a high-fat diet.

Processed saturated high-fat (HF) diets are linked with deterioration in cognitive functioning. Preclinical rodent models show that high-fat diets increase impulsive choices, which are suboptimal choices favoring a smaller-sooner (SS) reward over a larger-later (LL) reward. HF diets also lead to neuroinflammation which is a proposed mechanism of suboptimal cognitive functioning and might contribute to impulsive choices. The present study evaluated the effects of two HF diets (lard-based vs. shortening-based) relative to two low-fat control diets on impulsive choices in rats. In addition, the study investigated the effects of the lard-based diets on neuroinflammation in the brain (using microglia activation, IBa1, and astrocyte activity, GFAP as markers). Results showed that both HF diets increased impulsive choices. This demonstrates that processed/saturated HF diets increase impulsive choices and increase markers of neuroinflammation. The increased inflammation coupled with impulsive choices suggests that neuroinflammation may be a mechanism underlying suboptimal decision-making. Additional research is being conducted to analyze the microbiome of the subjects to determine whether changes in the microbiome profiles is predictive of the neuroinflammation. Such a relationship would further elaborate the mechanism linking HF diets to impulsive choice. The neurobiological health outcomes may be a mechanism leading to increased obesity. Kansas has been experiencing increasing obesity rates that are causing strain on the medical system. This research could have important implications for future obesity treatments.

Kourtney Rumback is a Junior at Kansas State University majoring in Pre-Medicine/Biology and Psychology. She is from Oakley, Kansas and pursuing a career as an ER Physician. She has been accepted into The University of Kansas School of Medicine for 2022 through the Scholars in Rural Health Program. At K-State, she works in two research laboratories: the RTD Psychological Sciences Laboratory and the Lee Microbiology Laboratory. While working with these labs over the past two years, she has been able to collaborate with both facilities to conduct an independent project examining the relationship between high-fat diets, gut microbiome composition, and impulsive behavior. She plans to use her research experience to further improve her knowledge about human health.

Student: **Broderick Sieh**
Year: Senior
Department: Mechanical and Nuclear Engineering
Mentor: Dr. Hitesh Bindra
Title: Ultrasonic Doppler Velocimetry for Flow Field Measurements in a Vertical Water Channel

Ultrasonic Doppler Velocimetry (UDV) is a flow field measurement technique, which can be used in opaque systems and opaque liquids. One of the problems with this method is that although it has been successfully implemented to measure flow in well controlled systems, due to large signal to noise ratios it has seen limited application. In order to demonstrate the accuracy and repeatability of this method in practically relevant systems, a vertical channel flow experiment was designed. The flow range for these studies were chosen to be in the laminar region, so that turbulent fluctuations are absent or negligible. A UDV probe was mounted on a moveable stage after the fully developed region of the channel. Within the laminar range, three sets of inlet flow rates were used as control parameters for experiments. The flow profile was constructed across the radial direction in the channel and noise levels were used to estimate measurement uncertainties. The experiment has demonstrated accuracy and repeatability for lower flow rates. Results involving intermediate and high flow rates will be available upon further investigation. Ultrasonic Doppler Velocimetry can be used to analyze fluid flows in systems that are used in dams as well as water treatment plants across the state of Kansas.

Broderick Sieh is a junior at Kansas State University pursuing a bachelor's degree in mechanical engineering with an emphasis on nuclear engineering. Broderick is originally from Stanton, Nebraska, but he considers Manhattan, Kansas to be his "home away from home." Since his first semester at Kansas State University in 2018, Broderick has been involved in undergraduate research for the Nuclear Energy Systems Transport (Nu-EST) laboratory. His past research experiences include working with KSU graduate students on experiments that involve the thermal-hydraulics of a gallium-cooled model reactor, the cooling of a reactor core with seawater, and the X-ray imaging of fluid flows. Currently, Broderick is conducting his own research to validate the accuracy and repeatability of ultrasonic doppler velocimetry techniques. Broderick is also involved in student organizations, as he serves as the president of the KSU Engineering Student Council and the president of the KSU chapter of the American Nuclear Society

Pittsburg State University

Student: **Thai Butcher**
Year: Senior
Department: Chemistry
Mentor: Dr. Santimukul Santra
Title: One-step synthesis of biodegradable 'click-able' polyester polymer for biomedical application

In this study, linear polyester polymers were synthesized using bio-based monomers including sorbitol and glutaric acid. In order to make the polyester polymer "click"-able, a propargylic acid derivative was used. The polymerization technique used in this research was a standard melt polymerization in the presence of a novel lipase enzyme catalyst, NOVO 435. The reaction was conducted at 90-95℃ for 72 h. Polymer samples were collected within 24 h after reaction completion to obtain accurate characterization. The polymer was purified and then characterized using spectroscopic methods such as NMR, GPC, FTIR, DSC, and TGA. The polymers were then used for the formulation of polymer-based drug delivery system using the solvent diffusion method with taxol as the drug. The delivery of drug using this drug delivery system was confirmed by performing cytotoxicity (MTT) assay, and prostate cancer cells were used as a model cancer. The in vitro experiments showed that the nanomedicines synthesized in this work are successful in being used for prostate cancer treatment.

My name is Thai Butcher, I am from Webb City, Missouri and I am an undergraduate student at Pittsburg State University, studying Polymer Chemistry. I am very interested in nanoparticles and their great properties for a variety of applications. In this study under the supervision of Dr. Santra, a biodegradable "click-able" polyester polymer was synthesized in a single step for biomedical applications. The purpose of the study was to create a material that would selectively target prostate cancer cells and effectively kill them. It was very important to make the material biodegradable and non-toxic, as to not make the process of chemotherapy more harmful for the patient. After the polymer was synthesized and the drug was loaded into the nanoparticle, various methods of characterization were used to determine the efficacy of the material.

Student: **Mark Arnce**
Year: Senior
Department: Chemistry
Mentor: DR. Ram Krishna Gupta
Title: Expandable Graphite as Efficient Flame-Retardant for Industrial Applications

Polyurethanes are used for many applications such as thermal and electrical insulators, furniture, car seats and interior parts, medical equipment and, many more. However, the high flammability of polyurethane foams is a major issue. To handle this issue, we used expandable graphite as an eco-friendly flame-retardant in polyurethane foams. The staring chemicals (polyols) for the polyurethane foams were synthesized using a facile approach where UV-light was used. The reaction was performed at room temperature without the need for solvent which makes this process attractive to industries. The two foams named 1T and 2T were prepared to see the effect of expandable graphite on their flammability and other physicomechanical properties. All the foams having various weight percentages of expandable graphite showed density in the range of 30-50 kg/m3 and closed-cell content over 90%.

The flammability of the foams was significantly reduced by the addition of a small quantity of expandable graphite. The neat 1T and 2T foams (with no expandable graphite) burnt for 42 and 83 seconds, respectively which reduced to 4 and 6 seconds on the addition of expandable graphite, respectively. Our research suggests that eco-friendly flame-retardants such as expandable graphite could significantly reduce the inherent flammability of polyurethane foams and make them very suitable for industrial applications.

My name is Mark Arnce, I'm an undergraduate student at Pittsburg State University studying Polymer Chemistry and Plastics Engineering Technology. For my research project I worked under Dr. Gupta and graduate student Felipe De Souza to make a flame retardant rigid polyurethane foam. The goal was to create a polyurethane foam with good flame retardant
properties that was cheap and maintained its mechanical properties. The polymer for the foam (an inherent flame retardant) was synthesized and mixed with expandable graphite to achieve this.

Student: **Caleb Durbin**
Year: Senior
Department: Biology
Mentor: Dr. Christine Brodsky
Title: Mammal communities in Kansas mined lands: Second year of Snapshot USA data collection

Recovery efforts on reclaimed mined lands are ongoing; however, there is a lack of data to indicate whether reclamation efforts are productive and effective. In 2019 and 2020, we participated in Snapshot USA, a collaborative, concurrent, nationwide camera trapping effort to collect data on local mammal communities. Our objective was to determine how mined land vegetation structure impacted mammal community composition and species richness and evaluate differences between sampling years. In September and October, we deployed camera traps in 10-12 forested mined land locations in Crawford County, KS for over 1,000 trap nights. At each site, we measured canopy coverage, ground cover, shrub density, and tree abundance and size. We observed 17 species across both years, with similarities in the most common species from 2019 and 2020. White-tailed deer (Odocoileus virginianus) and fox squirrels (Sciurus niger) were consistently among the most abundant species. In 2019, we found that tree abundance, leaf litter, and dead wood contributed to greater mammal species richness. We're still processing 2020 data to determine if the species richness trends are consistent between years. Locally, we will continue monitoring Crawford county's mined land areas with the goal of providing management recommendations to enhance local mammal diversity.

My name is Caleb Durbin, and I am an undergraduate student at Pittsburg State University in the Biology Department. Currently, I am completing my final courses to earn a B.S. in Biology with an emphasis in Wildlife Ecology and Conservation. For my research project, I worked with my advisor, Dr. Christine Brodsky and graduate student, Mary Whiteacre. Dr. Brodsky and I were invited to participate in Snapshot USA, a nationwide camera trap survey, in 2019. We were able to use the data we got from the 2019 and 2020 Snapshot USA cameras to determine how mined land vegetation structure impacted mammal community composition and species richness within our local Crawford county area and thus evaluate differences between the two sampling years

Student: **Maggie Murray**
Year: Senior
Department: Biology
Mentor: Dr. Christine Brodsky
Title: Temperature Decreases Mammalian Species Richness Nationwide

Climate change includes changes in temperature and precipitation; even the slightest deviations can throw off the equilibrium of an ecosystem. The purpose of this research was to investigate the trends between temperature, precipitation, and mammal communities. We used data from Snapshot USA, the first nationwide camera trap survey of the United States. Over 1,500 cameras were deployed over 52,000 trap nights from August – November, 2019. Cameras were placed throughout a variety of habitats, including desert, grassland, wetland, forest, and urban. We used Student's t-tests and generalized linear models to analyze the data in Program R. The average species richness was about 4 species per camera trap location, and the average temperature was 18 C, and the average precipitation level was 0.19 cm. We found that temperature had a significant negative relationship on mammal species richness and precipitation was not an accurate predictor. The next step of our study is to assess these trends within an urban to rural gradient.

Hello! My name is Margaret Murray, and I am an undergraduate at Pittsburg State University in the Biology Department. I am currently in my last semester studying Biology with an emphasis in Wildlife Ecology and Conservation. For this study, I worked with my research mentor, Dr. Brodsky, to study the relationships between temperature, precipitation, and mammal species richness. We utilized data from Snapshot USA, the largest camera trap study in the United States. Our objectives for this study were to investigate how mammal species richness is affected by temperature and precipitation. We used Program R to create linear models for our analyses.

The University of Kansas
Lawrence Campus

Student: **Jade Groobman**
Year: Senior
Department: Women, Gender, and Sexuality Studies
Mentor: Dr. Sarah Deer
Title: Jews of Color: Experiences of Exclusion and Inclusion

This social justice-based project explores how Jews of color experience racism in Jewish spaces, how white Jews recognize the existence of racism in Jewish spaces, and how Jews of color conceptualize how Jewish spaces can become anti-racist. The Jewish population is incredibly diverse; however this is rarely acknowledged in American Jewish spaces. As the call to racial justice has once again become prominent in the national discourse in the last several years, it is imperative that a community whose core values include social justice and equality characterize that in their spaces. Through an analysis of existing texts and semi-structured interviews with self-identifying Jews of color and white Jews, this project explores the unique experience of minorities within a minority, and how to best create equitable and anti-racist communities.

Jade Groobman is a senior from Boulder, Colorado majoring in Women, Gender, and Sexuality Studies with a double minor in Political Science and American Studies. She is passionate about anything related to social justice, specifically racial justice, anti-racism, and politics. Outside of academia and social justice, Jade loves taking care of her house plants, going on any adventure outdoors, and finding the perfect boba tea.

Student: **Rhianna Roth**
Year: Senior
Department: Chemical and Petroleum Engineering
Mentor: Dr. Mark B. Shiflett
Title: Project SAVE: Silica Adsorbed Vaccine Encapsulation

Approximately 90% of vaccines require a temperature-controlled supply chain that is critical to maintaining their efficacy; however, nearly 50% of the vaccines produced annually are wasted due to conformational changes in protein structure that occur when exposed to temperatures outside of the required range. A more sustainable technology is being developed for improving the thermal stability of protein-based vaccines via adsorption in mesoporous silica. The concept has been demonstrated using invasion plasmid antigen D (IpaD) on mesoporous silica gel. Silica samples with various physiochemical properties were characterized and tested using IpaD. Stabilization is believed to occur through hydrogen bonding between the silica pore surface and certain amino acids in IpaD. The silica-IpaD complex was heated above the denaturing temperature to simulate a break in the cold chain and a detergent, such as lauryldimethylamine oxide (LDAO), was used to desorb IpaD from the silica. Silicas with pore diameters between 15-25 nm achieved monolayer adsorption coverage and pores larger than 25 nm indicated multilayer coverage based on Langmuir modeling. Silicas with larger pore sizes generally released more protein during the desorption process. Circular dichroism (CD) confirmed that the encapsulated IpaD maintained its native secondary protein structure whereas the unprotected IpaD denatured after heating. The results indicate that silicas with a compatible pore size have the capacity to protect an α-

helical protein such as IpaD from thermal denaturation and provide strong evidence that this method of protein adsorption on mesoporous silica could be used for replacing a cold chain vaccine storage method.

Rhianna Roth is a student at the University of Kansas pursuing a degree in Chemical Engineering with a Biomedical emphasis. Upon joining the Shiflett Research Group in 2019, Rhianna worked in partnership with companies such as Dupont to evaluate advanced membranes for permeability, selectivity, and separation efficiency with applications in gas recovery and purification. In 2020, Rhianna transitioned to Project SAVE where the focus is on eliminating vaccine cold chain reliance by improving protein thermal stability using silica gel. The team recently published a manuscript entitled, “Protein Stabilization and Delivery: A Case Study of Invasion Plasmid Antigen D Adsorbed on Porous Silica,” in the ACS Langmuir Journal. Outside of the research lab, Rhianna also serves as the president of the KU Water Polo team.

Student: **Kade Townsend**
Year: Sophomore
Department: Molecular Biosciences
Mentor: Dr. Josephine Chandler
Title: Evolution of antibiotic resistance in the pathogenic bacterium Pseudomonas aeruginosa

Pseudomonas aeruginosa causes severe and often-fatal infections in burn victims and patients with the genetic disease cystic fibrosis, while consistently earning a spot in the Center for Disease Controls’ top-ten list of clinical threats. This is partially due to two underling factors: its intrinsic antibiotic resistance, and its ability to increase antibiotic resistance via genetic mutations. P. aeruginosa is also a model for understanding quorum sensing. Quorum sensing is a method of communication between bacteria. Quorum sensing systems become activated when the population reaches a high density or “quorum.” In P. aeruginosa, there are several quorum-sensing systems, and the lasR gene is considered a master quorum-sensing regulator. LasR controls several behaviors such as antibiotic resistance and virulence. Paradoxically, lasR deletion mutants (quorum sensing null) are common in cystic fibrosis infections. These patients are commonly treated with antibiotics, and it is not clear how lasR mutants, which are antibiotic-sensitive and less virulent, can thrive in this setting. We exposed P. aeruginosa to antibiotics in the lab to simulate natural evolution of antibiotic resistance. Antibiotic-exposed P. aeruginosa had a mutation in the translation elongation factor gene fusA1. In fusA1 mutants, deleting lasR increased resistance to antibiotics, rather than decreasing resistance. My results show that the mechanism might be through changes in regulation of the MexXY efflux pump, which removes antibiotics from the cell. Mutations in fusA1 are common in clinical P. aeruginosa, and this finding might provide a possible explanation for how lasR mutants can be selected in cystic fibrosis patients.

Kade Townsend is a first-generation sophomore from Topeka, KS. He has made Lawrence his new home where he attends the University of Kansas. Currently, his fields of study include microbiology, chemistry, and astrobiology. His interest in biology was really inspired by a teacher from his high school, then cultivated even more after being accepted into the Emerging Scholars program under the direction of Dr. Josephine Chandler. When he first joined the lab a year and a half ago, he was washing dishes and restocking reagents. After learning the basics, Kade began doing more chemistry, and then moved on to his current bacterial genetics project. As a newly accepted McNair Scholar, Kade is currently generating data for a new manuscript.

Student: **Anna Trofimoff**
Year: Senior
Department: Chemical and Petroleum Engineering
Mentor: Dr. Jennifer Robinson
Title: The Effect of Increasing Internal Phase and Organic Phase Composition on Emulsion Electrospun Scaffold Wettability

Temporomandibular joint osteoarthritis (TMJ-OA) is present in postmenopausal women 2-3 times more often than their male peers which suggests that estrogen hormone deficiency may play a role in acquiring the disease. We aim to deliver an agonist that will bind with estrogen receptor alpha (ERα) locally through use of a scaffold fabricated through emulsion electrospinning. The diffusional agonist release is dictated by tunable scaffold properties such as degradation rate, porosity, and potentially wettability. The amount of surfactant and internal phase present in the emulsion, in addition to ambient relative humidity, affect the location of surfactant within the polymer fibers. Surfactant rearrangement to the surface of the fibers versus internal pores affects the overall hydrophobicity of the fibers and therefore their wetting. The purpose of this study is to observe how increasing internal phase volume fraction, composition of organic phase, and relative humidity affect the wettability of emulsion electrospun scaffolds. Samples were electrospun at low (5 ± 10 RH) and high (50 ± 10 RH) humidity values. Emulsion samples of a biodegradable polymer poly(caprolactone) (PCL) with a surfactant, Span 80, and increasing aqueous internal phase (0%, 2%, 4%, and 8%) were compared to fibers made from corresponding polymer solutions using chloroform, or co-solvents chloroform and dimethylformamide (DMF), and chloroform and methanol. Contact angle data was collected over two minutes utilizing a Biolin Scientific Theta Lite 101 optical tensiometer. Rudimentary data analysis shows varying water absorption profiles for different fabrication conditions and therefore demonstrates the relocation of surfactant molecules within the fibers. The ability to control surfactant location is crucial for overall mesh wetting behavior which potentially affects diffusional drug release in TMJ-OA treatment applications.

Anna Trofimoff is a senior chemical engineering student with biomedical and pre-medical concentrations. Anna has worked in the Robinson Lab for 3 years and is a two-time recipient of the Undergraduate Research Award from the University of Kansas. She is also the vice-president of the Society for Biomaterials student chapter and a member of the KU Honors Program. In her spare time, Anna enjoys reading, swimming, and being outside with her dog, Sherlock.

Student: **Kaci Zarek**
Year: Junior
Department: Environmental Science
Mentor: Dr. Amy Burgin
Title: Using Fluorescence Spectroscopy to Characterize Dissolved Organic Matter in Eastern Kansas Streams

Changing land use affects the quality of water in streams. Plants that grow in a watershed can alter the chemical composition of dissolved organic matter (DOM; a major form of carbon) in streams. In turn, the type of DOM in streams can affect the kinds of microbes living in a stream. However, the effects of land use changes on stream chemistry and microbiomes, particularly agriculturally dominated landscapes, are understudied. Therefore, we studied land use changes effects on the availability of carbon in six Eastern Kansas streams: Three streams drained predominantly cropland covered landscapes (>80% of land use classified as row crop) and three streams drained predominantly grassland

watersheds (>80% grassland). To understand the influences of land use on streams' DOM and microbial metabolism, we asked: Are there different microbial signatures in DOM changing over time in streams draining primarily cropland versus grassland watersheds? We used fluorescence spectroscopy to examine how the origin of organic matter (OM) and the microbial influence vary between our six streams. Fluorescences measurements provide insight into the microbial influence (whether the OM was recently produced within the stream or not; termed the Freshness Index (BIX)) and the origin of OM (terrestrially or microbial derived; termed the Fluorescence Index (FI)). Initial results indicate BIX and FI do not vary greatly between streams draining primarily cropland versus grassland watersheds. Future work of analyzing dissolved organic carbon samples to calculate the specific ultraviolet absorbance spectrum will promote further understanding of the relationship between DOM, microbial metabolism, and land use effects.

Kaci Zarek is a junior at the University of Kansas from Norfolk, Nebraska, majoring in environmental studies and minoring in Spanish. Ms. Zarek conducts research in Dr. Amy Burgin's lab at the Kansas Biological Survey. Ms. Zarek began working in Dr. Burgin's lab during her first week at KU; during her sophomore year, she initiated an independent project described below. She completed the project successfully despite COVID disruptions and intends to use the experience as a platform for furthering her education in graduate school.

The University of Kansas
Medical Center

Student: **Nadeen Abusalim**
Year: Senior
Department: School of Nursing
Mentor: Kelly Bosak, PhD, APRN, ANP-BS
Title: Feasibility of Implementing Clinical Guidelines with Patient Reported Outcomes Across a Digital Network

The American Heart Association's Get With The Guidelines-Heart Failure (GWTG-HF) registry is effective in improving clinical outcomes for HF patients. The value of evaluation using patient reported outcomes (PROs) of their physical, emotional and social health is gaining recognition by providers. Implementing guidelines in the electronic health record (EHR) is one strategy to improve outcomes for HF patients. To assess the data available through the EHR of 12 health systems of the Greater Plains Collaborative (GPC), an integrated digital network to inform a future implementation trial. The aims were to: 1) determine the population of HF patients across the GPC; and 2) assess GWTG-HF registry status and PROs accessible in the health system's EHRs. A descriptive feasibility query was conducted via REDCap survey sent to the data managers of the GPC. Ten of 12 (83%) sites responded. The count of adults, age ≥18 years with HF (ICD10: I50) since January 1, 2019 indicated a range of 7,768-36,536 patients per site. There were 2 (16.6%) sites with PRO measures accessible in the EHR and six (50%) sites with PROs outside the EHR.

Nadeen Abusalim is from Olathe, Kansas and is a graduate of Olathe South High School. She attended Johnson County Community College prior to entering the BSN program at the KU School of Nursing. Currently, Nadeen is in the BSN Honors program working with Dr. Kelly Bosak. In addition, Nadeen works in the Emergency Department at the University of Kansas Health System. After graduation, Nadeen would like to work in the Emergency Department and will begin her graduate education at the University of Kansas, earning her Doctor of Nursing Practice specializing in the Family Nurse Practitioner track.

Student: **Brynn Hammett**
Year: Senior
Department: School of Nursing
Mentor: Maryellen Potts, Ph.D.
Title: Immunotherapy Patient Education: A Cross-sectional Survey of Patient Knowledge and Information Seeking Strategies

Immunotherapy for people with cancer can cause immune-related adverse events (irAEs) which negatively impact patient's health and life quality and may cause death. These irAEs may present during treatment and into survivorship. Patients receive education from healthcare providers to identify, monitor, and manage them long-term. The primary purpose is to understand patients' knowledge of immunotherapy, including irAEs, how to identify an irAE, and whether they received treatment for it. A secondary purpose is to learn if patients received irAE education, from whom they received it, and where they seek information about irAEs. This study utilizes a single, cross sectional survey created in REDCap. We will collect data for recruitment by retrospective chart review utilizing medication reports of patients receiving immunotherapy at the University of Kansas Health System. Data analysis will be descriptive statistics. We anticipate that findings will reveal whether patients retain knowledge about

their treatment from their provider, how they experience irAEs, and what other sources they seek to learn immunotherapy information.

Brynn Hammett is from Wamego, Kansas and a graduate of Rock Creek High School. She attended Kansas State University prior to entering the BSN program at the KU School of Nursing. Currently, Brynn is in the BSN Honors program working with Dr. Maryellen Potts. In addition, Brynn works on the Neuro ICU at The University of Kansas Medical Center. After graduation, Brynn would like to work in pediatrics and plans to go to graduate school to work as a Nurse Practitioner in pediatric oncology.

Student: **Annastasia Milton**
Year: Senior
Department: School of Nursing
Mentor: Shin Hye Park, Ph.D., RN
Title: The Effect of Unit-level Practice Environments on Nurse Overtime and Job Enjoyment

Despite research examining practice environments and nursing workload and burden, there is a lack of data-based evidence on the impact of practice environment on nurse overtime and job enjoyment. The purpose of this project is to examine the relationship between nurse practice environment and nurse overtime and job enjoyment. This study utilized 2018 National Database of Nursing Quality Indicators® (NDNQI®) RN Survey data. The sample included 1,984 units from 268 hospitals, with data from five major types of units. Nurse practice environment were examined using Practice Environment Scale of Nursing World Index (PES-NWI), a 4-point Likert scale with 31 items. This secondary data analysis study used descriptive statistics, correlation, and multivariate regression. Our findings provide evidence for improving practice environment in the pursuit of reducing nurse overtime and improving nurse job enjoyment. In particular, our findings support evidence for nursing administrators that staffing, and resource adequacy would have more impact on reducing nurse overtime and improving job enjoyment for unit RNs. Multivariate regression is currently in progress.

Annastasia Milton is a BSN student in the KU School of Nursing. She from Omaha, Nebraska, and attended the University of Kansas prior to entering the BSN program at the University of Kansas Medical Center. Currently, Annastasia is in the BSN Honors program working with Dr. Shin Hye Park. After graduation, Annastasia would like to work in the critical care or emergency nursing, until returning to school to earn her Doctorate of Nursing Practice and work as a nurse practitioner. When she isn't in class or clinical rotations, Annastasia can be found running, climbing, and spending time with friends (within her social circle of course).

Student: **Rachel Rosenberg**
Year: Senior
Department: School of Nursing
Mentor: Moya Peterson, PhD, APRN, FNP-BC
Title: Treatment of Diabetes in Adults with Down Syndrome

Down syndrome adults are predisposed to develop autoimmune disorders. Among the common ones are hypothyroidism, rheumatoid arthritis and diabetes including Type 1 and Type 2. This population is also more likely to have a BMI that classifies them as obese or overweight, therefore theoretically increasing the likelihood of the development of diabetes. Due to this predisposition and the clinical prevalence of diabetes within the adult Down syndrome community, a quality assurance project will be done to give insight on how well this disease is being managed according to the standards set by the American Diabetes Association (ADA). The purpose of this study is to review data from two clinics that

serve adults with Down Syndrome and have a comorbid diagnosis of diabetes in the local area. The data will then be compared to the standards of care and treatment for adults with diabetes as established by the ADA. A descriptive study will be used to compare patterns of disease treatment and management of patients with diabetes these two clinics. The data will be pooled. Data will be reviewed utilizing REDcap, a web-based application used to capture data for clinical research. Variables such as medication regimen, blood pressure values, weight management, microalbumin testing and A1C levels will be collected for direct comparison to ADA published standards and goals. Demographic factors such as age and gender will be noted as well. We will determine if the patients with diabetes are being treated in accordance with the ADA standards and if they are obtaining the established goals in those recommendations.

Rachel Rosenberg is from Leawood, Kansas and a graduate from Blue Valley North High School. She attended The University of Kansas prior to entering the BSN program at the KU School of Nursing. Currently, Rachel is in the BSN Honors program working with Dr. Moya Peterson. In addition, Rachel will be doing her clinical rotation on the Labor and Delivery Unit at Saint Luke's East Hospital. After graduation, Rachel would like to attend a pediatric Nurse Residency Program.

Student: **Courtney Sobek**
Year: Senior
Department: School of Nursing
Mentor: Barbara J. Polivka, PhD, RN, FAAN
Title: Dissemination of COVID-19 Information through Professional Nursing Associations

In a pandemic such as COVID-19, risk communication plays a key role in educating communities to prevent the spread of the disease. Healthcare providers need reliable and accurate resources to be properly prepared. The purpose of this study was to determine the type and content of COVID-19 information displayed by 13 professional nursing organizations over time. A retrospective comparative analysis was completed to determine the type of COVID-19 information displayed on websites of 12 nursing organizations (e.g., Sigma Theta Tau, Emergency Nurses Association) and changes in the information displayed over time. Screenshots of website pages were captured over a 4-month period (April-August 2020) at 2-week intervals. Data were content analyzed by two researchers using structured review criteria. Discrepancies were discussed until 100% agreement was reached. Results revealed information posted was specific to the type of nursing specialty (e.g., emergency department) and included COVID-19 related resources, personal accounts from members, caring for patients with COVID-19, donation opportunities, legislative updates, and coping mechanisms. Information remained relatively consistent over time with organizations occasionally editing and reorganizing webpages. Several organizations added COVID-19 continuing education opportunities for members. Next, senior nursing students will be surveyed regarding their preferences on the information being provided by nursing organizations websites.

Courtney Sobek is from Overland Park, Kansas and is a graduate of Blue Valley North High School. She attended the University of Kansas prior to entering the BSN program at the KU School of Nursing. Currently, Courtney is in the BSN Honors program working with Dr. Barbara Polivka. In addition, Courtney works on the Cardiothoracic Surgery Progressive Care unit within the University of Kansas Health System. After graduation, Courtney will be assuming a fulltime nursing position within her current unit at the University of Kansas Medical Center.

Washburn University

Student: **Viktoria Donetz**
Year: Senior
Department: Chemistry
Mentor: Allan Ayella
Title: Site-Directed Mutagenesis of Wild-type LDH affects its pH and Enzymatic Activity

Lactate Dehydrogenase (LDH) is an important enzyme that allows cancer cells to survive through anaerobic respiration mechanisms which lead to cancer metastasis. In this study, we focused on changing the structure of LDH through two different single amino acid substitutions. Therefore our research question was "does changing a non-conserved non polar amino acid (Glycine) at position 68 of the LDH protein affect it's pH optimum, and enzyme kinetics?' To test this question, we used site directed mutagenesis to change the glycine to a polar non-charged amino acid threonine (T), and hence created a G68T mutant LDH protein. We also changed the glycine to polar charged amino acid, Lysine (K), and hence created a G68K mutant LDH protein. pH optimum experiments were then designed for the wild type, G68T, and G68K mutants. We also performed enzyme kinectics assays using the Michealis-Menten model. The results showed that the wild type, and G68T mutant maintained some amount of enzyme activity at drastic pH changes while the G68K mutant was only active at physiological pH range. Enzyme kinectics data through the Lineweaver-Burk plot showed that G68K has drastically lowered Vmax values compared to the wild-type. Substrate affinity measured through Km was also drastically reduced for the G68K mutant. This results therefore show that changing G68 to T and K, non-conserved amino acids in the LDH protein affects it's pH optimum and enzymatic activity. These approaches may be useful in targeting the LDH gene for treatment of cancer.

I was born Tulsa, Oklahoma and raised in Bartlesville, Oklahoma for the first thirteen years of my life. I've looked up to my four much older siblings (by 12-22 years) which have made me an aunt to six, most of them actually being my age. It wasn't until 7th grade when my mother and I moved to Hoisington, Kansas where I graduated from Hoisington High School at the top of my class. My latest move was to Topeka, KS to attend Washburn University where I have been working diligently towards my degree in Chemistry while also being the co-captain for the women's club rugby team. My next step is to attend graduate school where I plan to get my Master of Science in Forensic Chemistry.

Student: **Matthew Christman**
Year: Senior
Department: Physics
Mentor: Vincent Rossi
Title: Preliminary Imaging of Cellular Material via Quantitative Phase Imaging

Quantitative Phase Imaging (QPI) has come forth as a useful tool in collecting data for cellular biology. Alterations to cell phase via changes and cell depth and arrangement of material (which impacts index of refraction) give insight to a cell's reaction to differing environments. QPI allows for the collection and analysis of this change in phase, providing the ability to image cells based on depth and index of refraction. Here we provide an introduction to how a quantitative phase microscope may be designed, as well as examples of analysis using phase imaging.

Matthew Christman is a junior at Washburn University and Arizona State majoring in Physics and Electrical Engineering. He is involved in a variety of organizations on campus, including Student Government, the Kappa Sigma fraternity, and the Physics and Engineering Club. In the fall of 2018 Matthew began his current work in Bio-photonics with Dr. Vincent Rossi. Through this work he received the KINBRE STAR scholar award. During the summer of 2019 Matthew was accepted to the REU program at the University of Chicago's Pritzker School for Molecular Engineering where he was able to research condensed state matter with the Yang lab. Following graduation Matthew plans to continue his education at Arizona State, and eventually pursue a doctorate degree.

Student: **Frances Befort**
Year: Senior
Department: *Molecular Biology and Biotechnology*
Mentor: Takrima Sadikot
Title: Identification and Annotation of Genetic Sequences in Drosophila ananassae, contig17

The genome of Drosophila melanogaster has been a highly studied genome in biology for the past twenty years. D. melanogaster is a model organism for studying the developmental and cellular processes common in other eukaryotes. Here, the D. melanogaster genome was used as a reference for identifying genes and genomic elements in contig 17, an approximately 18,000 bp region of the related Drosophila ananassae species. The analysis of the sequences and data collection was done using open source computational genomic tools for sequencing, gene-prediction, and genome browsing. The resources used during this project were obtained through the Genomic Education Partnership (GEP). GEP is a bioinformatics program sponsored by Washington University, in St. Louis. The analysis of contig17 of the Drosophila ananassae genome yielded the presence of four genes, homologous with genes Ddx1, Rich, CG11523, and JMJD7 of D. melanogaster. No incomplete genes or nonconsensus regions were found present within this contig.

Frances Befort is a senior at Washburn University studying Molecular Biology and Biotechnology. She was born and raised in Topeka, KS. During her time as an undergraduate student at Washburn University, she has participated in several clubs and organizations including the American Medical Student Association (AMSA), Tri Beta Biology Honors Society, and served as Chapter President of Alpha Phi Fraternity. Ms. Befort has also been a President's List Honoree for seven semesters. In her community, she has donated her time as a volunteer at Stormont Vail Health Care and as an organist at Mater Dei Catholic Church and the Washburn Catholic Campus Center. After graduation in Spring 2021, Ms. Befort plans to attend medical school and pursue a career as a physician.

Student: **Cody Ratterman**
Year: Senior
Department: Computational Physics
Mentor: Brian C. Thomas
Title: Modeling Ozone Depletion-Induced Climate Change Following a Supernova

Ozone in Earth's atmosphere is known to have a radiative forcing effect on climate. Motivated by geochemical evidence for one or more nearby supernovae about 2.6 million years ago, we have investigated the question of whether a supernova could cause a change in Earth's climate through its impact on atmospheric ozone concentrations. We used the "Planet Simulator" (PlaSim) intermediate-complexity climate model with prescribed ozone profiles taken from existing atmospheric chemistry modeling. We found the effect on globally averaged surface temperature is small, but localized changes

are larger and differences in atmospheric circulation and precipitation patterns could have regional impacts. Further work is being done to study longer time frames, previous geographic time periods, and multiple types of supernovae.

I am a Senior at Washburn University pursuing a Bachelor of Science in Computational Physics with minors in Computer Science and Mathematics. I am from Olathe, KS and enjoy working at our family's climbing gym business and pole vaulting on the college track team. My research uses climate modeling to study the effects of ozone depletion from supernova events. My professor Dr. Thomas helped publish a paper on our initial findings. Now we are testing other supernovae types and prehistoric environments. The usage of computers to measure, model or perform real-world and virtual experiments is growing. I want to use them for futuristic experiments and inform ourselves for complex decisions. After graduating I hope to work as a software engineer building computer models and simulations.

Student: **Price Kramer**
Year: Senior
Department*:* Physics, Chemistry
Mentor: Vincent Rossi
Title: Development of Image Processing Algorithms to Create a Novel Method to Characterize Actin Polymerization in the Prescence of Palladin

Palladin is an F-actin binding protein that is present in both normal cell and cancer cell movement. Palladin is present in increased concentrations in cells that are actively moving, such as along a wound edge or in metastasizing cancer cells. Cells that are depleted of their palladin concentration have been found to display defects in cell mobility, disorganized actin cytoskeleton structure and a significant decrease in the amount of polymerized actin. Beck et.al. suggests that the correlation between the loss of palladin and decreased levels of actin polymer suggests that palladin may have a direct role in enhancing actin polymerization. Actin polymerization can be observed using total internal reflection fluorescence (TIRF) microscopy. Traditionally TIRF images have to be processed by hand for rate of growth calculations. Through the use of the MATLAB image processing toolbox, a set of image processing algorithms were developed to characterize and calculate the growth of actin fibers as a function of time in the presence and the absence of palladin. The use of MATLAB decreases analysis time from hours to a matter of seconds. As well as a characterization of rate, work has also been done in order to analyze the bonding of actin fibers with MATLAB using the Computer Vision toolbox. Pending construction and analysis, the MATLAB algorithms could be used and scaled to other microscopy imaging methods such as holographic fluorescence imaging.

I grew up in McPherson, KS before coming to Washburn to study Chemistry and Physics. In my undergraduate career I have completed 4 semesters of research in Organic chemistry and 3 semesters of research in Biophysics. I am a current member of Kappa Sigma, the Washburn Physics Club, the Washburn Chemistry Club, and the Washburn Honors Society. During my undergraduate tenure, I have been a 2x President's list recipient and a 6x Dean's list recipient. After finishing my degree I plan to attend either the KU School of Law or the University of Houston Law Center to study intellectual property and patent law in order to become a patent attorney.

Wichita State University

Student: **Barrett Houchen**
Year: Senior
Department: Biological Sciences
Mentor: Dr. Gregory Houseman
Title: Investigating the Spatial Structure of Macrophomina phaseolina and Its Correlation With Biotic and Abiotic Factors in a Native Tallgrass Prairie Community

Macrophomina phaseolina is a fungal pathogen capable of infecting over 500 plant species across the world and one of the most prominent soybean pests in Kansas. Investigation has been conducted on *M. phaseolina's* presence, due to its effects on agriculture and crop yield. Conversely, minimal research has examined the fungal pathogen's significance in native prairie communities, its correlation with environmental factors, or spatial structure. Our goals are to better understand *M. phaseolina's* behavior in native prairies in hopes to apply these insights to agricultural systems. In the summer of 2020, we quantified the spatial structure of *M. phaseolina* in a 15 x 15 m grid of untilled tallgrass prairie and correlated *M. phaseolina's* abundance with soil and plant characteristics. We found a high variability in the density of *M. phaseolina* and limited evidence for spatial aggregation of pathogen abundance. Additionally, bivariate analysis revealed weak correlations between pathogen abundance and individual soil properties and no correlation between pathogen abundance and plant variables. The results found rule out several key factors and suggest a better understanding of how physical disturbance and the mechanism of spread for *M. phaseolina* contributes to the large differences in density observed.

My name is Barrett Houchen. I'm a Senior Undergraduate at Wichita State University, enrolled currently in what is my final semester. Born and raised in Wichita, I attended Maize High School, graduating in 2018. I plan to go on to Graduate School to obtain my master's in biological sciences with a concentration in environmental/ecological/organismal (EEO). During that time, I will continue my research with Dr. Houseman over *Macrophomina phaseolina* to better understand its possibly impactful role or lack thereof in community ecology. Upon completion of my master's, I plan to enter a career of either environmental consulting or further research into conservation.

Student: **Shamir Khan**
Year: Senior
Department: Chemistry/ Biochemistry
Mentor: Dr. Moriah Beck
Title: Improving Personalized Medicine Through Systematic Protein Engineering of LDH

Lactate dehydrogenase (LDH) is an enzyme that catalyzes the conversion between lactate and pyruvate and is found in the cells of almost all living organisms. Recent studies have indicated that changes in conserved regions of proteins cause a toggle switch effect – modulating the function in an "on/off" fashion. Whereas changes to the sequence of non-conserved regions result in changes similar to a rheostat, where function gradually changes. Previous studies exploring the effect of changes to non-conserved regions have not yielded conclusions regarding either the type of substitutions that favor gradual change over severe functional changes. Here, we plan to investigate the relationship between changes in protein sequence and overall function and stability to assist in building a database that will enable better predictions in the future by examining non-conserved residues. To accomplish this, wildtype and mutant versions of LDH were purified before performing kinetic assays, fluorescence to

measure chemical denaturation, and a circular dichroism spectroscopy to determine the thermal stability. We confirmed that non-conserved mutations showed gradual changes in the catalytic rate and the stability of the protein. An interesting mutation engineered at residue 68 resulted in an enzyme that was completely inactive, but also extremely stable. Protein stability tests can be related to proteopathic diseases, where the main cause of disease is related to protein structural and stability changes. Therefore, our research seeks to provide a deeper understanding of the relationship between protein sequence variation with disease state to improve personalized medicine in the future.

My name is Shamir Khan. I am a senior student at Wichita State University, majoring in Biochemistry with minors in Spanish and Honors. I have lived my whole life in Wichita, KS, and I am eager to become a practicing physician in my home state. My career goal is to pursue my lifelong dream of becoming a primary care physician to help the underserved. To accomplish this, next year I will be attending University of Kansas School of Medicine. Outside of school, I am an avid runner – I have run multiple half marathons and I ran my first full marathon last year. I am also a skilled golfer, having played through high school with several rounds under par. I hope you enjoy my presentation.

Student: **Cameron McGinley**
Year: Senior
Department: Computer Science
Mentor: Dr. Sergio Salinas
Title: Deep Learning Detection of Phishing Emails

Phishing emails are one of the most common and effective tools that cybercriminals use to gain access to an organizations' network or personal information. To prevent these attacks, email service providers use a variety of tools that can detect phishing emails by inspecting their metadata and URLs in the body. However, cybercriminals are able to bypass these filtering techniques by avoiding adding URLs to their messages and instead engaging victims in a conversation to advance their attacks. In this paper, we design a convolutional neural network that can efficiently identify phishing emails only using the text in the email body. The proposed model takes as input an embedding of body text and outputs a probability indicating the likelihood that the message is malicious. We evaluate our proposed model and find that it can identify phishing emails with high accuracy and a low false negative rate. Cameron McGinley is a Junior at Wichita State University studying computer science, with a minor in mathematics. Cameron began working with Dr. Sergio Salinas at Wichita State in the summer of 2020, where they conducted research on the detection of phishing emails using deep learning and responding to the malicious emails using natural language generation. After completing his undergraduate degree, Cameron

Cameron McGinley is a Junior at Wichita State University studying computer science, with a minor in mathematics. Cameron began working with Dr. Sergio Salinas at Wichita State in the summer of 2020, where they conducted research on the detection of phishing emails using deep learning and responding to the malicious emails using natural language generation. After completing his undergraduate degree, Cameron intends to apply to graduate school for a master’s degree in computer science with hopes to continue studying artificial intelligence. Outside of Wichita State University, Cameron works for NetApp doing software quality assurance, and enjoys spending his time coding small projects.

Student: **Rupert Nunez**
Year: Junior
Department: Industrial Engineering
Mentor: Dr. Laila Cure
Title: Spatiotemporal Access to Healthy Food in Sedgwick County

Healthy food access and the local food environment have become an important issue for city and state governments. Since the 1990s, studies have been conducted across the world documenting the food environment at local, state and country wide scales. Most studies have focused on whether a source of healthy food exists in or near a community. However, no studies have been found investigating the time-dependent availability of these sources. To create a detailed analysis of healthy food availability in Sedgwick county in terms of geographical location and time availability, we recorded the GPS coordinates and hours of stores and markets with produce available in Sedgwick county from Google Maps data. We extracted information about the population information using Census tract data from the Census Bureau. We then calculated distances from locations to the centroids of every census tract and estimated the following spatio-temporal accessibility measures: the number of stores within 2 miles for different time slots in a day per census tract, and the time-weighted weekly accessibility index indicating the proportion of time during a week that a census tract has access to food. The results were displayed graphically using Tableau to create custom maps, and the conclusion was that healthy food is widely available during the most popular shopping times for more urban census tracts. Rural areas experience much longer drive times to get to healthy food. Northwestern Sedgwick county has the longest average distance calculated for all times and days.

Hello, my name is Rupert and I moved to Wichita in 2017 to attend Wichita State. I'm originally from San Antonio, Texas. Since middle school I've known that I wanted to do something engineering related. In high school I took as many engineering classes as I could and even joined a couple of the engineering clubs. I think it's always good to also have a few non-technical hobbies. I was heavily involved in both my high school and college choirs. As much as I love engineering, some of my favorite memories are of being on stage. When not in class, working on homework or gaining a new appreciation for winter; I enjoy playing guitar, building guitars, photography and exploring Kansas.

Student: **Alexandra Olmstead**
Year: Senior
Department: Physics/ Communication Sciences and Disorders/ Electrical Engineering and Computer Science
Mentor: Dr. Erin O'Bryan and Dr. Huabo Lu
Title: Computerized Sentence Building as a Therapy Tool for People with Aphasia

The purpose of this multidisciplinary project is to develop a therapy tool for people with aphasia, a language disorder acquired as a result of a stroke or brain injury. In 2019 and 2020, patients participated in a pilot study in which they trialed a new computerized sentence building therapy for aphasia. This therapy was presented by an experimental software program called DMDX which is designed to measure accuracy and reaction times of patient's responses to written word stimuli. This data was then processed and analyzed using Python scripts. These analyses revealed that the patients' performance on the therapy task improved, and they also reported improved quality of life. Currently, we are developing an Android app that will take the place of DMDX and the Python code. The app will allow patients to practice the computerized sentence building therapy task on their own time.

Alexandra Olmstead is a senior undergraduate student pursuing a Bachelor of Science degree in physics with an Emory Lindquist Honors Scholar track at Wichita State University. Along with majoring in physics, she is minoring in computer science, mathematics and chemistry. Alexandra is currently working with Dr. Erin O'Bryan and Dr. Huabo Lu in the development of an Android app that will administer therapy treatments to people with aphasia. A few of her other areas of interest include quantum computing and machine learning. After the completion of her undergraduate degree, she plans to attend graduate school to further pursue these research areas.