



WELCOME TO THE  
1ST ANNUAL ATU  
RESEARCH  
SYMPOSIUM

DEAR STUDENTS, COLLEAGUES AND GUESTS:

WELCOME TO THE 2023 ARKANSAS TECH UNIVERSITY RESEARCH SYMPOSIUM!

TODAY REPRESENTS AN IMPORTANT STEP IN THE ONGOING DEVELOPMENT OF THE PARTICIPATING STUDENTS AS THEY PERSIST ON THEIR JOURNEY OF INQUIRY, CRITICAL THINKING, DISCOVERY AND REFLECTION. REGARDLESS OF YOUR ROLE IN TODAY'S EVENT, I AM GRATEFUL FOR YOUR ATTENDANCE AND PARTICIPATION AS WE WORK TOGETHER AS A UNIVERSITY COMMUNITY TO SUPPORT UNDERGRADUATE AND GRADUATE RESEARCH OPPORTUNITIES.

THE INFORMATION YOU WILL BE EXPOSED TO TODAY IS THE RESULT OF MANY LONG HOURS, THE APPLICATION OF CONSIDERABLE BRAIN POWER AND THE LEADERSHIP OF FACULTY MENTORS. I CONGRATULATE EACH STUDENT ON MAKING THE COMMITMENT AND SACRIFICES NECESSARY TO EARN THIS OPPORTUNITY. I APPLAUD MY COLLEAGUES WHO HAVE STOOD SHOULDER-TO-SHOULDER WITH THESE STUDENTS AND CHALLENGED THEM TO REACH BEYOND THEIR PERCEIVED LIMITS.

ERNEST HEMINGWAY ONCE OBSERVED "THERE IS NOTHING NOBLE IN BEING SUPERIOR TO YOUR FELLOW MAN; TRUE NOBILITY IS BEING SUPERIOR TO YOUR FORMER SELF."

THE ATU RESEARCH SYMPOSIUM IS REFLECTIVE OF THAT SPIRIT OF CONTINUOUS IMPROVEMENT. MY WISH FOR ALL IN ATTENDANCE IS THAT THESE PRESENTATIONS WILL CONTRIBUTE TO YOUR PERSONAL DEVELOPMENT AND SPARK NEW QUESTIONS AS WE SEEK TO BECOME BETTER SCHOLARS TODAY, TOMORROW AND INTO THE FUTURE.

DR. ROBIN E. BOWEN PRESIDENT  
ARKANSAS TECH UNIVERSITY



# Event Schedule

## Oral Presentations

Time & Location	Title	Presenters	Faculty Mentor
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8:30 am Brown 134	Student Willingness to report Weapons and School Violence at a Rural Secondary School in Arkansas: A Quantitative Study	Travis Poole	Steve Bounds
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School safety continues to be a concerning and vital topic in education. This quantitative study examines the willingness of students from a rural Arkansas school district to report weapons being brought to school or violent occurrences happening at school and analyzes the behavior associated with students reporting or not reporting. The study examines barriers that exist to help to explain why students would not report weapons or violent incidents to staff members or adults in the school district. The study surveyed 52 students from a secondary school with Likert-style survey questions. The questions were grouped into different variables such as demographics, academic success, relationship to the perpetrator, reporting frequencies, and knowledge of available school resources. This allowed the researcher to analyze any data trends from students who were willing to report violent occurrences or weapons being brought to school versus those who would not. While not all variables showed a statistically significant difference in the two reporting groups, there were three variables that did show a statistically significant difference in the students' willingness to report. The relationship between the victim/perpetrator and the potential reporting student was a statistically significant indicator of reporting behaviors. The fear of retaliation was also a statistically significant variable in students' willingness to report. Lastly, the knowledge of available resources at school to report and whom to report to was statistically significant in comparing the groups of students who were willing to report versus those who were not.

8:30 am Brown 253	Premium Single Phase Motor for ABB Group	Daniel Johnson Sky Friar Jesse Willer	Carl Greco
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ABB Group is in search of a next generation premium single phase motor. An integrated drive paired to a three phase motor will allow the company to take advantage of current three phase motor automation capacity while presenting the end user with a simple, ready to use motor operating off of single phase power. This project is the design of such an integrated drive. The drive will accept 115/230 Vac, single phase supply power and send it through a full bridge rectifying, voltage doubling circuit. This circuit will rectify the alternating current to direct current and increase the voltage to approximately 320 Vdc. The direct current will then be fed to an intelligent power module to be converted to 3 phases of alternating current. A microcontroller, powered via separate power supply circuitry, will govern the intelligent power module.

8:30 am Brown 148	5000 Years of Egyptian Double-Pipes and Musical Cultural Influence	Samuel Holtkamp	Phoebe Robertson
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Ancient Egypt was one of the earliest of human societies to pursue the development of music, and many of the musical concepts they pioneered over five-thousand years ago are still in use. Along with the preservation of musical ideas, certain ancient Egyptian instruments have also stood the test of time, through both preservation and evolution. However, the development of these instruments from their ancient to modern forms is sparsely discussed. Along with this, virtually no research explores the evolution of these instrument forms from a chronological context. This paper seeks to investigate and chronologize forms of the ancient Egyptian double-pipe, from their earliest depictions to the modern instruments derived from these ancient forms. Using this timeline, this paper will also seek to understand the methods by which traditions are able to be upheld. In understanding how tradition and culture are upheld, these principles can then be transferred to elevate one's understanding of how traditions and culture can be upheld in a musical context. This research investigates the topic from not only a musicological perspective, but also an anthropological perspective, combining the studies to fully understand the importance of not only these instruments, but culture and tradition in the musical canon.

8:30 am	IEEE R5 Robotics Competition	Ryan Zacharias	Matthew Young
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Brown 254

2023

Brayson Standridge

Autonomous robots, whether that be an aerial drone or a ground vehicle, are the future of robotics. Our design project aims to explore the process it takes to develop autonomous robots capable of intercommunication. A robotics competition held by the IEEE organization gives us the ability to directly see how our design compares to competitors across multiple states. How this competition is carried out is described in the contents of the report. We must also address some of the objectives that must be accomplished in order to create a successful design and acknowledge constraints that influence the boundaries of the project. To do that, requirements have been imposed on our design. These requirements must be met during the creation of our systems of intercommunicating robots. Fulfilling these requirements and objectives will be the key to making this project a success.

9:05 am  
Brown 134

Organs in Colonial New  
England Puritan Churches

Jacob Skaggs

Phoebe Robertson

Puritans, often referred to as the founders of America, held strict religious doctrines that alienated themselves from other Christians. One such doctrine is the outlawing of instruments in public worship. However, it took only about 150 years for such anti-instrument sentiments to shift towards acceptance. The reinstatement of organs in Puritan Churches seems to follow trends of increased religious tolerance caused by both theological and social developments. This paper relates organs to tolerance through examination of theological and musical documents from 17th and 18th century Puritans. This research provides a lens for examining today's church worship doctrines through the context of historical trends.

9:05 am  
Brown 148

Hands-On Activities in the  
Classroom

Harley Krigbaum

Heather Stefanski

Do hands-on activities in the classroom assist in increasing student participation and motivation? I observed 5th grade students in their science classroom. They were doing a lab using small group station rotations. I noticed that the only time every student in the group participated in the lab was when they were completing an activity that involved more physical aspects than that of a typical written assignment. I based my research around this observation and implemented strategies that allowed me to observe students completing both written assignments and hands-on activities, and collected data to figure the differences to find if the type of activity truly had an effect on student participation and motivation.

9:05 am  
Brown 253

Functional Integrated Storage  
Housing

Andrew Hilsdon  
Alex Holland  
Thomas Dodds  
Vana Ducusin

Jacob Weidenfeller

The vertical rotating shelf is a new design concept for a robotics laboratory that provides a compact and efficient storage solution for a variety of components and materials. The shelf is designed to maximize storage capacity while minimizing the amount of space required. The shelf consists of a sturdy metal frame with multiple shelves attached to it. The shelves are modular and the bins on the shelves can be changed to accommodate items of varying sizes. The rotating mechanism is powered by a motor, which allows for easy access to all items on the shelf without having to move or reorganize the entire storage area. The shelf is ideal for use in a robotics laboratory, where space is often at a premium and storage needs are constantly changing. The compact design of the shelf allows for easy installation in a variety of settings, including on a workbench or in a corner of the lab. The rotating feature also enables efficient organization of materials and components, reducing the time and effort required to locate specific items. Overall, the vertical rotating shelf is a practical and innovative storage solution for a robotics lab that provides a unique combination of space-saving design and efficient organization capabilities. Its sturdy construction, adjustable shelves, and rotating mechanism make it a versatile and reliable addition to any lab looking to optimize their storage capabilities.

9:05 am  
Brown 254

Hydrogen Fuel Cell Quadcopter

Blake Andrews  
Fisher Wagner  
Dylan Moore

Edward Greco

Our project, the Hydrogen Fuel Cell Quadcopter, is a concept of using hydrogen fuel cell to power a drone by turning the hydrogen into electricity and powering the electric motors on the drone. The hydrogen will react with oxygen to create electricity, which will send power to the Flight Controller and Electronic Speed Controller to evenly distribute power to the motors and sensor with input from the controller to fly the drone. By using hydrogen, the drone has the potential to fly for a significantly longer time with the limiting factor being the size of the tank.

9:40 am  
Brown 148

Perceptions of Varying Types of  
Health Conditions Among  
Arkansas Tech University

Leala Sorrell

Mikles-Schluterman

## Students

Attitudes towards minor ailments, psychological conditions, chronic illnesses, and disabilities were measured among students of Arkansas Tech University through an online questionnaire. 10 questions were asked for each condition type for a total of 40 questions. Participants were asked to rate their level of agreement from 1-5, 1 being "highly disagree" and 5 being "highly agree". Low scores (higher response rate of "strongly disagree") represented attitudes of Talcott Parsons' sick role theory. High scores (higher response rate of "strongly agree") represented attitudes of the ICF model and inclusiveness. The minor ailments/illnesses scale had the lowest mean score of 27.186. The disabilities scale had the second-lowest mean score of 29.124. The psychological conditions scale had the second-highest mean score of 30.340. The chronic illnesses scale had the highest mean score of 31.588. Findings suggest that on average, Arkansas Tech University students hold moderately inclusive attitudes toward health conditions. Statistical significance was found between the condition scales, suggesting that participants did not regard or treat condition types as the same. Keywords: health, attitude, conditions, sick role theory, Talcott Parsons, ICF model, inclusiveness

9:40 am Brown 253	Cloud Chamber Design	Saul Ancelmo Munoz Moya Carter Moore	Matthew Young
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This engineering design abstract proposes a cloud chamber cooled by thermoelectric modules, designed for studying subatomic particles. The chamber contains a gas that condenses into clouds due to the temperature gradient created by the modules. The system has low power consumption and temperature control for optimal cloud formation. The cloud chamber is a cost-effective solution for particle physics research and education. It is compact and easy to use, making it a valuable tool for scientists and educators.

9:40 am Brown 254	Distracted Driving Detection System	Tristan Caja Wesley Heikes Chance Gregurek Lizzi Riney	Kaiman Zeng
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In 2020, distracted driving claimed 3,142 lives in the United States[1]. Using current technology, our project aims to prototype a device that uses computer vision to crack down on this dangerous behavior while working with insurance agencies that provide incentives for customers to adopt the device. At the heart of this project is a deep learning algorithm trained to classify images on a set of 10 classes: safe driving, texting - right, talking on the phone - right, texting - left, talking on the phone - left, operating the radio, drinking, reaching behind, hair and makeup, and talking to passenger. This algorithm is deployed onto a microcontroller, which is mounted above the passenger side window with a connected camera and power supply, taking images like the one shown above. In short, the algorithm classifies periodically taken images and determines the motorist's safe-driving performance. The driver's performance is then sent to the insurance company through a mobile application. From there, the insurance company will adjust the user's insurance rate based on their safe driving performance. Thus, an incentive for drivers is made to adopt the product and practice safe driving more thoroughly.

10:00 am Witherspoon Auditorium	Weber's Clarinet Concertino Opus 26	Cadence Graves	Phoebe Robertson
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As a professional musician, it is important that one does not simply learn the notes and rhythms in a piece of music, but also the history surrounding it and its composer. There is much to learn about a piece of music and how it may be performed from original scores, performance history, and knowledge of the composer and the time period in which it was written. This lecture recital aims to open eyes to the amount of relevant knowledge one can gain from researching a piece of music's composer, setting, and the importance of doing this research. This presentation will include a lecture on the history of the composer, Carl Maria von Weber, the clarinetist for whom his Clarinet Concertino Op. 26 was written, Heinrich Baermann, as well as the time period and culture surrounding it and its success in performance. This knowledge is drawn from Pamela Weston's Clarinet Virtuosi of the Past and G. Henle Verlag's Urtext version of the concerto, among other sources. Following this background information will be a performance of the concerto followed by a close examination of the forms, variations, and styles used in the piece.

10:00 am Witherspoon Auditorium	The Harbinger of Character Euphoria: A Study of the Clarinet in the Orientalist Symphonic Works of Nikolai Rimsky-Korsakov	Tess Butler	Phoebe Robertson
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Nikolai Rimsky-Korsakov was a prolific Russian composer during the 19th century, well known for his orchestral, programmatic works. Besides being well-known for his orchestration skills, he became a prominent figure in guiding the development of attributing characteristics to specific instruments. This phenomenon, led by the Mighty Five, became a significant part of the Western interpretation of instruments' roles in orchestral works, as declared by Richard Taruskin. The clarinet is one of few instruments that have the ability to create various character archetypes within a singular work. In Korsav's Scheherazade and Capriccio Espagnol, he demonstrates the versatility of archetypes the clarinet is able to produce, unlike any other member of the orchestra. By understanding the orientalist views, in 19th century Russia, with the aid of Edward Said, and investigating the adaptation of themes within these two works, the clarinet proves to be a multifaceted voice still developing today. This lecture recital will demonstrate how Korskaov used the clarinet to represent multiple personas throughout his works, and how it changed the course of the clarinet's role in a symphonic setting. Through a musical demonstration of various excerpts from Scheherazade and Capriccio Espagnol, I will demonstrate the clarinet as a catalyst for character archetypes and how their development through the Russian viewpoint of foreign countries created a unique soundscape for the clarinet.

10:15 am Brown 134	Military-Affiliated Student Experiences in Post-Secondary Education	Cole Hendrix	Rene Couture
Military-Affiliated Student Experiences in Post-Secondary Education			

10:15 am Brown 148	Utilizing VR Scenarios to Aid Student Empathy in Challenging Interactions	Peter Unwer	Susan West
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This project will enable faculty in the Parks, Recreation and Hospitality Administration program at Arkansas Tech University to implement virtual reality training into the existing curriculum to ensure students are better prepared for the mental demands of the field. Through creating hospitality and tourism virtual reality scenarios, this will aid in the hands on teaching for our students to better understand the complexities within the industry that a typical classroom cannot provide. For example, Hilton recently partnered with a company called Sweet Rush to create a virtual hotel experience for team members. The project was a success, reporting 87% of team members changing their behavior through VR training. In addition, "the empathy-focused learning experience gives hotel employees an opportunity to see what it feels like when interactions are managed poorly or handled correctly by members of staff." Since Covid, the hospitality and tourism industry has been impacted by negative experiences and students will learn new soft skills through VR simulation. This study seeks to monitor core body temperature, heart rate and stress levels. All are key indicators of the student's physiological condition when they're working in a possible confrontation interaction with a guest. Pre and Post surveys will be administered to evaluate if the VR simulations aid in reducing stress levels. The department can also utilize the VR simulations to recruit students at job and career fairs throughout the state, this would increase our enrollment, thus increasing the tourism industry workforce.

10:15 am Brown 253	An Investigation into the Physical Properties Governing the Coupled Harmonic Oscillator	Ethan Taylor JJ Rivera	Jessica Young
The coupled harmonic oscillator is an extremely important model in physics - especially in the field of solid state physics where the forces that tie atoms to their equilibrium positions are much stronger than their inter-atomic coupling forces. Given a coupled spring-mass system, we want to theoretically determine and then experimentally verify the normal frequencies involved in coupled harmonic oscillation. To do so, a coupled spring-mass system was built using an air track, carts, and PASCO motion detectors, the normal frequencies were theoretically calculated, and then we experimentally verified these normal frequencies with 4 trials: Symmetric, Antisymmetric, and two Mixed Modes.			

10:15 am Brown 254	Premium Single Phase Motor for ABB Group	Daniel Johnson Sky Friar Jesse Willer	Carl Greco
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ABB Group is in search of a next generation premium single phase motor. An integrated drive paired to a three phase motor will allow the company to take advantage of current three phase motor automation capacity while presenting the end user with a simple, ready to use motor operating off of single phase power. This project is the design of such an integrated drive. The drive will accept 115/230 Vac, single phase supply power and send it through a full bridge rectifying, voltage doubling circuit. This circuit will rectify the alternating current to direct current and increase the voltage to approximately 320 Vdc. The direct current will then be fed to an intelligent power module to be converted to 3 phases of alternating current. A microcontroller, powered via separate power supply circuitry, will govern the intelligent power module.

10:50 am  
Brown 134

Supporting Responder  
Resiliency: The Effects of Stress  
and Mental Health on Retention  
and Burnout in the Humanitarian  
Disaster Workforce

Misty Sutton

Daniel Warwick

Based on recent reports of a mass exodus from the emergency management field, the Journal of Emergency Management conducted a survey in 2021 to measure the stressors and mental health of emergency management professionals and the impacts of those stressors on retention and burnout. Using the JEM study as a guide, our survey was developed and modified to measure the effects of stressors and mental health on retention and burnout specifically in the humanitarian disaster workforce. Our own instrument was developed with the unique needs and motivators in mind that may have special impact in the humanitarian disaster workforce using the Professional Quality of Life (ProQOL5) survey, Team Connection Assessment, Organizational Culture Assessment Questionnaire, the IPIP version of the Big 5 Markers, and engagement questions from the original JEM survey to measure factors such as burnout, compassion fatigue, secondary-traumatic stress, feelings of connection with teams and leadership, motivations for serving, organizational culture, and personality types. Humanitarian disaster response organizations such as the American Red Cross make up a significant part of the workforce involved in disaster responses in the United States. As disasters grow in frequency and intensity, so does the need for humanitarian disaster responders. The goal of this study is to evaluate those stressors which are most likely to affect burnout and retention, and to identify possible interventions, to build a more resilient humanitarian disaster workforce.

10:50 am  
Brown 148

Environmental Factors Affecting  
Coleoptera Biomass in the Ozark  
Mountain Range in Arkansas

Hayley Springsteen

Jorista Garrie

Terrestrial invertebrates including species of Coleoptera play an important role in many ecosystem services including: soil formation and fertility, pollination, decomposition and nutrient turnover, and population regulation of other organisms through predation. Coleoptera are often vital in determining biodiversity and conservation techniques. The purpose of this study was to determine which environmental factors and forest management practices affect Coleoptera assemblages and to further assist ecologists in improving management techniques in the future. We collected data over the course of two weeks in the Arkansas portion of the Boston Mountain range. We used black light traps to trap insects for 10 nights for a total of 61 sites in 4 forest management types (fire, regenerative harvest, commercial thinning, and understory thinning). Habitat and vegetation assessments were also taken and recorded at each site as well as various environmental factors including temperature (degrees Celsius), humidity (%), wind speed (km/h), and atmospheric pressure (hPa). The total Coleoptera biomass (for all 61 sites combined) was 488.133g with an average of  $8.002 \pm 0.7058$  g per site. A generalized linear model showed that there was significantly greater biomass at sites where humidity was higher ( $t_{56}=2.19 \pm 0.06$ ,  $p=0.03$ ). There was also greater biomass at sites that were commercially thinned when compared to sites that had a combination of management types ( $t_{54}=2.19 \pm 3.09$ ,  $p=0.03$ ). These results suggest that prime habitat for Coleoptera may be somewhere with higher relative humidity, and commercial thinning should be considered compared to other management types when taking beetle populations into account.

10:50 am  
Brown 253

Kayak Automated Steering

Nick Gilbert  
Emily Trotter  
David Asimbaya  
Jorge Garcia

Zahra Zamanipour

The problem presented is to automate a fishing kayak to make traveling long distances more manageable while maintaining the flexibility, portability, and size of the kayak without making major modifications to the already working item. The proposed design is aimed to solve the steering issues that a fixed seat in a kayak may have and the consistent paddling by supporting them with an automated system. The device is not meant to interfere with the system's manual operation but to provide a sense of aid when needed.

10:50 am  
Brown 254

Velocity Assistance Training  
System

Mark Harmon  
Mason morgan

Carl Greco

Make a cheap and effective way of tracking velocity, power, work, and distance to use for someone to track their progress with velocity training

11:25 am  
Brown 134

A Comparative Study of  
Specific Enthalpy of Aromatic  
Hydrocarbons with Simple  
Carbohydrates

Kohl Kervin

Subha Pratihar

Calorimetry is an aspect of chemistry primarily focused on determining the enthalpy of reactions ( $\Delta H_{rxn}$ ). In the bomb calorimetry technique, the heat of combustion of chemical compounds can be measured experimentally. From this data and the application of Hess's Law,  $\Delta H_{rxn}$  of several chemical reactions can be determined. The technique of bomb calorimetry can be applied to food, fuels, pharmaceuticals, and many other fields. The objective of the present project is to determine the specific enthalpy of various simple carbohydrates (naturally occurring sugars) through bomb calorimetry and compare it with that of aromatic hydrocarbons. By performing benzoic acid standardization reactions with the Parr™ Model 1341 Oxygen Combustion Vessel, the calorimeter constant was found to be  $10.2717 \pm .0565$  KJ/°C with a 95% confidence interval, allowing the accurate determination of specific enthalpy for each of the sugars at constant volume in a pure O<sub>2</sub> vessel. As we proceed with the experiment several aromatic hydrocarbons (e.g Naphthalene, etc) and several simple carbohydrates (e.g Sucrose, Glucose, etc.) will be tested to obtain the enthalpy of combustion ( $\Delta H_{comb}$ ). We will perform quantum chemical calculations on the reactant and product molecules to determine the  $\Delta H_{comb}$  and compare the experimental values with computational data.

11:25 am                      The Synergistic Effect of                      Jonathan Wollenberg                      Mariusz Gajewski  
Brown 148                      Loganetin and 5-fluorouracil on  
the Carcinogenesis of  
Glioblastoma Cancer Cells

Chemoresistance is a discouraging trend that affects chemotherapeutic agents like 5-fluorouracil (5-FU) and leads to decreased efficacy of treatment. This has led to numerous studies into compound synergism. Glioblastomas are a type of lethal cancer that has shown chemoresistance to therapeutic agents such as 5-fluorouracil. Being the most common and lethal primary brain tumor, research on mechanisms of growth inhibition is vastly important (Lustig, 2018). The purpose of this study was to analyze whether 5-fluorouracil and a compound named Loganetin could synergistically inhibit glioblastoma cancer cells. This specific study utilized an extract created from the *Lonicera etrusca* plant. It was found that the extract displayed anticancer properties on glioblastomas, as well as increasing the effect of low to medium concentrations of 5-fluorouracil on glioblastomas. Further testing on increased extract concentrations showed a significant increase in the anticancer properties of the extract.

11:25 am                      Affordable Range Finding                      Matthew Hubbard                      Jacob Weidenfeller  
Brown 253                      System                      Carson Chentnik  
Marlon Ulloa  
Karlee Wagnon

A system of devices using UHF RFID used to determine the location of a handheld device. Using triangulation, transmitters will determine the location of the handheld device in comparison to one of 18 beacons placed on a golf course. This allows the handheld device to determine the player's distance to said hole.

11:25 am                      A Study of Deep Neural                      Wesley Heikes                      Kaiman Zeng  
Brown 254                      Networks in the Application of  
Distracted Driving Detection

As the world continues to become more technologically advanced, distracted driving will continue to be a growing danger to the public. Convolutional neural networks can be used to monitor driving and differentiate distracted driving from safe driving. A popular distracted driving dataset created by State Farm called the Distracted Driver Dataset can be trained with the Auto-Keras model API. Auto-Keras is a system that tailors a machine learning model to fit a given dataset. While experienced neural network designers can create neural networks to produce incredibly accurate results, Auto-Keras gives those with less expertise a method of designing a network in a time-efficient manner. The resulting network created through Auto-Keras achieved an accuracy of 95.5%

12:00 pm                      Investigating Properties of                      Ethan Taylor                      Matthew Hankins  
Brown 253                      Commercially Available IR  
Detector Technology

With the ability to transcode valuable information from light emitting objects, infrared (IR) detector technology has begun to find recreational use in the form of non-contact thermometers and home insulation tools. Research and industry have long been using IR technology in the form of high-altitude balloons, CubeSats, and UAV cameras, but the technology remains a niche market, and thus, a burdensome financial investment. As such, given general consumer products recently introduced as more economically viable, we sought to design an affordable IR camera capable of effective and meaningful data collection. To do so, we utilized a Raspberry Pi 4 and 3 thermal arrays of increasing quality to design an IR camera. With this design, we recorded measurements and conducted data analysis at room temperatures to understand noise properties and determine the efficacy of our camera as a scientific tool. We also plan to perform similar experiments at extreme temperature environments, the data of which contributes to the continued creation of an affordable IR camera that can be used recreationally and across many industries, including but not limited to astronomy, meteorology, environmental sciences, and engineering.



12:00 pm  
Brown 254

Risk Assessment and Survey  
Drone

Austin Rankin

Matthew Young

This project entails a survey drone that will be used to provide a reliable and quick risk assessment report that could be used rather than land survey equipment. The drone will be designed to fly survey missions using an onboard GPS system, during the flight the drone will be taking pictures that will be used for a 3D rendering. The design will consist of a custom flight control system for control over the drone, and a custom efficient body, both specified for the objectives the drone will be completing. Once the survey mission is complete the images taken during flight will be uploaded to a 3D rendering software to create an accurate 3D map of the surveyed land. This 3D rendering will then be used to simulate different aspects of the landscape to write a detailed description of the land for a consumer.

1:00 pm  
Brown 134

Tried & True Tattoo Application  
Presentation

Simon Chaisouang  
Natalie Garcia  
Nathan Plummer  
Akiharu Esashi

Bhaskar Ghosh

In this project we have developed a web application for Tried and True Tattoo Company to establish a better online presence and make setting up appointments for customers more convenient. The agile methodology was implemented during the development of the application to organize planning, understanding app requirements, assign tasks, and keep track of progress though the duration. Analysis models and diagrams were utilized to better understand the application needs when entering development. Learning and understanding full-stack technology was very important for the development of this project.

1:00 pm  
Brown 148

Systems II: Delicioso Cupcakery  
& Coffee Shop Website

Catherine Hudson  
Star Douangchanh  
Connor Scott  
Francisco Charqueno

Bhaskar Ghosh

Our client, Delicioso Cupcakery & Coffee Shop, has been looking to expand their marketing through an online storefront. The client also expressed interest in starting a newsletter to send customers information of updates and events. Team Bakers has taken on the client's requests and created an online storefront that that will allow the client to market online. The storefront provides customers with the ability to peruse products and create online orders. Our website features a quick-and-easy way for customers to navigate to the online store to order and fully customize cakes and other specialty desserts. The website also features a wedding cake form where customers can leave their contact information to start the process of ordering a custom wedding cake. Customers can also opt to sign up for the newsletter by providing their email. Our client will be provided with admin login credentials where they will be able to login and access several admin-only pages: pages for editing the gallery, accessing wedding cake request forms, and a to-do-style page where they can manage current orders. The client will be able to send out mass emails for their newsletters using MailChimp.

1:00 pm  
Brown 253

Falling Water Falls: 55 Years  
Later

James Alumbaugh

Joshua Lynch

In the late 1960s, Arkansas Archaeological Society commissioned rescue and recovery surveys of at-risk bluff shelter sites throughout the Ozark-Ouachita National Forest. The bluff shelter associated with Falling Water Falls had already suffered significant disturbance before formal recovery efforts could be conducted. Archaeologists Thelma and Louis Gregoire were tasked with investigating the Falling Water Falls site from May 1967 through December 1968. During their seven site visits in this time, the Gregories collected more than 100 artifacts from the damaged site area. Artifacts recovered from the Falling Water Falls site area include stone artifacts, braided fibers, woven basketry, pottery sherds, cultivars fragments, and bone tools were previously curated by the U.S.D.A. US Forest Service starting in September 1988 and were then transferred to Arkansas Tech University at that time. Efforts to rehouse the collection and bring it into compliance with the Native American Graves Protection and Repatriation Act was carried out in 2012. Despite the extraordinary character of the Falling Water Falls assemblage, the materials remain understudied and under reported. This on-going project conducts the first holistic inventory and functional analysis of the Falling Water Falls collection. What does the archaeological evidence suggest about the occupation history and site function at Falling Water Falls? Do these patterns change over time? By applying modern archaeological methodologies, including radiocarbon dating, low-powered microscopy, and digital 3d scanning and imaging technologies, this project collects qualitative and quantitative data across the total assemblage to characterize the occupation record of Falling Waters Falls shelter. Building on this novel data, we offer recommendations for preserving and increasing access to the Falling water Falls bluff shelter collections and modern site area. This project will provide needed and long overdue analysis and interpretation of the artifacts of the Falling Water Falls site assemblage and make it possible to appropriately disseminate the information for continued research.

1:35 pm  
Brown 134

Premium Wireless

Andrew Clark  
Brandon Monroe

Bhaskar Ghosh

Garrett Kenney  
Dakota Burkhart

Our work implements an inventory system and appointment system for the Premium Wireless phone company. It includes separate views for employees to manage inventory and view appointments for the day and the near future and allows for customers to view all current inventory and set an appointment.

1:35 pm  
Brown 148

ArkaValley Liquor: Simplifying  
Restaurant Alcohol Orders

Isaiah Kitts  
Cameron Lumpkin  
Bradlee Treece  
Dayton Drilling

Bhaskar Gosh

The ArkaValley Liquor system is a web-based ordering platform designed to simplify the process of ordering alcohol for local restaurants. Currently, restaurants place orders by emailing the store, which makes it difficult to maintain a paper trail and track order details. With the ArkaValley Liquor system, the ordering process is automated, and all order details are saved in one central location. Each restaurant will have a login, ensuring only authorized individuals can place orders. The system will also provide a record of each restaurant's most recent order, making it easy to reorder if necessary. By using the ArkaValley Liquor system, local restaurants will be able to streamline their alcohol ordering process, save time and effort, and reduce the chances of errors or miscommunications. Overall, the system aims to enhance the customer experience by providing an efficient, secure, and user-friendly platform for alcohol orders.

1:35 pm  
Brown 253

A Feasibility Study to Determine  
the Most Optimal Location for a  
Mountain Bike/Ski Resort in  
Greater Northwestern Arkansas

Timothy Constantino

Patrick Hagge

This project was completed by the author with some assistance and consulting from his faculty mentor, Dr. Patrick Hagge. In order to answer the fundamental study questions concerning the feasibility of a mountain bike and ski resort being established in Arkansas, ArcGIS Pro mapping software was utilized. Some data was collected from outside sources, including NOAA and the Arkansas GIS Office. Other data was either interpolated from the aforementioned sources or created by the author. For region wide suitability, four broad factors were considered. Those included aspect, slope, temperature, and snowfall. Ten specific resort sites were chosen and then ranked considering each of those factors along with accessibility, the presence of important cultural sites, existing infrastructure, and the relative size of skiable and bikeable terrain. Based on the data and analysis, the best subregion for the resort is the Ozark Plateau and the most optimal location is located north of Harrison on the Missouri border.

1:35 pm  
Brown 254

The Importance of  
Public/Private Partnerships for  
Supply Chain Success in  
Emergency Management and  
Homeland Security

Rick Neudorff

Rejina Manhandar

During the global COVID-19 pandemic response, health care related supply chain issues pulled the curtains back to expose a disjointed, mis-managed and fragile supply chain. This dysfunction eventually impacted billions of people globally and significantly extended the supply chain recovery from COVID-19. The perceived strength of our domestic supply chain was weakened by minimal collaboration between the federal government and the private sector, which manages the majority of supply chains, during the early days of the pandemic. Additionally, the Strategic National Stockpile (SNS) was depleted due to many years of under-budgeting for supplies and the situation was not widely understood within the federal government, nor the public. The Federal Emergency Management Agency (FEMA), which is the federal agency behind the development of public private partnerships (PPP), was still managing recovery from multiple major events when the pandemic began. They were assigned oversight and management of the national COVID supply chain response. The FEMA staffing levels were far below what was required, and additional staffing could not be hired in a short period of time. This presentation will outline existing challenges, real event problems with those relationships and make recommendations on how to expand and grow the relationships for the next disaster.

2:10 pm  
Brown 134

Use of Deep Reinforcement  
Learning in Financial Trading

Akiharu Esashi

Bhaskar Gosh

Applications of deep reinforcement learning are varied in many fields, but the key function that models carry is all the same 'decision-making'. The real-world environment includes complexity in the present and future sequences to decompose optimization in decision-making. Financial trading data is a typical instance of those stochastic environments such that it even changes rapidly and continuously. In this survey, we comprehensively review this deep reinforcement learning application in three distinct financial trading categories; crypt currency, foreign

exchange, and stock, and we compare each conducted model, data generalization method, and return of trading in research. As a common fact, significant superiority cannot be determined in different data environments; however, the comparison layouts of the effectivity in the same category. Finally, we discuss the challenges of new research in this field and the possible approaches to solve them.

2:10 pm Brown 148	The Ozark Getaways	Evan Matlock Avery Harrah Houston Barber Marcus (Tony) Gasca	Bhaskar Ghosh
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Website designed for usage of renting AirBnb houses outside of the original website under the specific owner.

2:10 pm Brown 253	Their Struggles Continued: Analyzing Federal Presence in Arkansas's Contraband Camps	Kimberly Green	Kelly Jones
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Contraband camps were makeshift communities housing runaway African Americans during the American Civil War. The term "contraband" denoted runaways' quasi-free status in the eyes of the Union army, who managed the sites. Civil War contraband camps not only existed to secure the safety of black refugees but also became centers of active recruitment for the Union army. Recent scholarship by historians Jim Downs and Amy Murrell Taylor has raised the call to better understand the experiences of the Civil War's black refugees. Unaware of what the future might hold, African Americans employed a day-to-day approach to make sense of their situation, emphasizing community, self-sufficiency, and safety. Many viewed the contraband camps as springboards to a successful and autonomous life free from enslavement. The humanitarian crisis born out of the Civil War strained the Union Army. As the government tackled the humanitarian crisis simultaneously while black Arkansans survived the hardships of contraband camps, outside societies arrived in Arkansas offering relief for black Arkansans and the government. In 1865, following the creation of the Bureau of Refugees, Freedmen, and Abandoned Lands, the government formed an entity designated to provide employment and security for Arkansas's freedpeople. My research follows these societies assisting the government by providing supplies and working with the Union army. My research follows General Frederick Steele's march during the Little Rock campaign in 1863 to examine the strengthening of the federal presence in Arkansas to highlight the reforms of how contraband camps operated.

2:45 pm Brown 134	Graduate Faculty Directory	Joseph Freeman Christopher Andrews Cody McKenney Drake Traylor	Asim Shrestha
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The Graduate College would like to update the current faculty search page to filter search results by Department and Research in addition to Name. With the current system, a person who wanted to find an unknown professor based upon a department or an interest in research topic would be unable to search because the only option is to type the professor's name. We have created a website linked to a database containing graduate faculty that is able to search by name, filter by department, and search through the professors' listed research topics. This website will be much more useful and easier to use with an updated design to be more appealing to the user.

2:45 pm Brown 148	Natural State Coffee Roasters App	Brody Shrum Eli Smith Corey Schmidt Aaron Horne Blake Gray	Bhaskar Ghosh
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We have worked with a local coffee grounds company, Natural State Coffee Roasters, to develop a mobile app for iOS and Android that allows customers to order monthly subscriptions of coffee directly from the company. The app is built from scratch with the React Native JavaScript framework and it is built to be entirely customizable by future developers. The app pulls from a database server that is fully scalable to our clients needs and future prospects

2:45 pm Brown 253	Diplomatic Relations between the United States and Venezuela, 1945-1948.	Ross Seidenschwarz John Linn	Michael Tarver
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This presentation briefly explores diplomatic relations between the United States and Venezuela during the period 1945 and 1948. While these years may seem arbitrary to United States historians, within Venezuela the three years were noted for a brief period of democracy, sandwiched between two periods of authoritarian rule. Known as the Trienio in Venezuelan history, the national government was headed by Rómulo Betancourt from October 1945 to February 1948 and Rómulo Gallegos from February to November 1948. Within the United States, this time period corresponds with parts of the first and second administrations of Harry S. Truman. This time period is fundamental to understanding modern Venezuelan politics, as it was during the short-lived democratic Trienio that Venezuela underwent significant political change. New parties were formed; and democracy became institutionalized by universal, direct, and secret balloting. The undergraduate researcher aspect of this project focused on the examination of primary and secondary source materials, including government documents and newspaper articles. The student-conducted research was empirical, thus there were no specific questions guiding the analysis. Details were recorded and summaries were created of the examined documents, using a revised instrument from the U.S. National Archives and Records Administration. In consultation with the Project Director, analysis was undertaken of the collected data. The preliminary findings of the project support the position that although during the years under review the United States was primarily interested in hemispheric security, the various nations of Latin America were more concerned with maintaining political stability and obtaining financial and military assistance from the United States.

2:45 pm Brown 254	The Collapse of the Lehman Brothers and the Economic Fallout	Lauren LeRoy Mark Kuykendall	Tracy Johnston
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In this case study, I will examine the causes and effects of the bankruptcy of the investment banking company, Lehman Brothers. I will also examine the economic and financial conditions of the business leading up to the collapse, what they truly were and how that differed from what everyone was misled to believe. I want to examine and explain the falsified financial statements and show how they deceived investors. I will discuss the ethics and rules that were violated to cause the collapse. I will also discuss the economy after the collapse and how it affected not only investors, but others outside the company as well.

3:20 pm Brown 134	Reworking of the Arkansas Tech Human Resources Employee Records software using the Evisions Argos System and Development of a Proof-of-concept MEAN Stack Employee Records Application	Dalton George Brayan Bonilla-Chavez John Modica Angelina Das Julian Hunt	Bhaskar Ghosh
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Evisions Argos is a real-time reporting tool used by Arkansas Tech in many record-keeping departments. Reworking HR's software using this tool, security and database access concerns were negated, as Argos is already connected to the University's backend. Using Argos, we have made ATU HR's employee records software more user friendly and built a system that can be pushed to production for use by the university. As a secondary portion to this final project, we developed a proof-of-concept web application using the MEAN (Mongo, Express, Angular, Node) stack. This gave us the opportunity to produce a full-stack application from scratch as well as learn new technologies that many in the group were unfamiliar with.

3:20 pm Brown 148	Programming Sequence Improvement Program (PSIP)	Musfikur Rahaman	Robin Ghosh
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Every semester, students from various STEM (Science, Technology, Engineering, and Mathematics) majors at Arkansas Tech University take the programming sequence (PS) courses (over 650 students in the 2020–21 academic year). The Engineering and Computing Sciences Department has struggled to retain students in the PS courses. Minor efforts have been made to increase retention, but they have had little success. The Programming Sequence Improvement Program (PSIP) aims to increase retention and student success in three PS courses: Foundations of Computer Programming I (COMS 2104), Foundations of Computer Programming II (COMS 2203), and Data Structures (COMS 2213), reducing the rate of D, F, Withdraw, and Incomplete grades by 10% annually from the current average baseline of 32%, 35%, and 27%, respectively (2015-2019). The main goal of this PSIP project is to change the face of the PS program within the first two years of study by enhancing programming techniques for students. The project's interventions are likely to influence ATU students' academic performance and retention, leading to higher degree completion rates. This program used four different methods to reach its objective: creating a tutoring lab for students enrolled in a programming course, implementing communication and collaboration tools such as Discord and Webex for students, researching current pedagogies for teaching programming, and better aligning the curriculum with platforms like GitHub, Hackerrank & LeetCode.

3:20 pm Brown 253	College of Business Prospective Students Webpage	Ashlyn Ward Brayden Reddin Joseph Morton	Bhaskar Ghosh
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Caden Bewley  
Marvin Martinez

The College of Business wanted a webpage that makes applying to one of their majors more user-friendly. Currently, incoming freshmen tend to choose the wrong major as the application process can be confusing. They needed to reduce the redundancy of inputting information, so they asked for the application on their webpage to auto-fill on Arkansas Tech University's application webpage.

3:20 pm  
Brown 254

Tesan LLC

Mitch Moua  
Austin Norman  
Bradley Linton  
Christian Cole

Bhaskar Ghosh

Over the semester, we have created a website for our customer, Tesan LLC. They are a tote-selling business and we offered to help build them a website to begin an online presence. We created a website and database for them from scratch. On our website, we talk about what Tesan LLC is, the products they offer, a log-in system for the customers, and an ordering system for the customers as well.

3:55 pm  
Brown 134

Application Support Ticketing  
System

Patrick Tullos  
James Boyd  
Jace Orr

We have been working on a help desk ticketing system that can store and track technical support requests.

3:55 pm  
Brown 148

Crime Prediction Using Machine  
Learning: The Case of the City  
of Little Rock

Zurab  
Sabakhtarishvili  
Clayton Jensen  
Sijan Panday

Robin Ghosh

Crime is a serious problem in the city of Little Rock, Arkansas. In this study, we aim to develop a machine learning model to predict criminal activities in the city and provide insights into crime patterns. We analyzed publicly available crime datasets from Little Rock Police Department from 2017 to 2023 to identify trends and patterns in crime data. We used data cleaning and exploratory data analysis techniques to prepare the data for machine learning. Furthermore, we created visualizations to better understand crime trends in the city. We employed the Neural Prophet model for time series forecasting to predict daily crime counts. The model was trained on data from Jan 2017 to Nov 2021 and tested on data from Nov 2021 to March 2023. We evaluated the model using Root Mean Squared Error (RMSE), Mean Squared Error (MSE), Mean Absolute Error (MAE), and R2 score. The results show that the model is able to accurately forecast the crime count in Little Rock with an error rate of under 10%. The main contributions of this study are as follows: 1. Cleaned and analyzed publicly available crime data to identify trends and patterns in Little Rock crime data. 2. Developed a machine learning model to predict daily crime counts in Little Rock. 3. Evaluated the performance of the machine learning model using standard metrics and achieved promising results. Our study demonstrates the potential of machine learning algorithms to predict crime and provide insights into crime patterns. Our findings can be used to inform law enforcement agencies, policymakers, and third parties, such as business owners in Little Rock, to develop effective crime prevention strategies. Research was funded by the Undergraduate Research Scholarship Award provided through Arkansas Tech University.

3:55 pm  
Brown 253

Recent Developments in  
Hydrogen Fuel Cell-Powered  
Drones

Seyed Mohammad  
Sanjari Pirmahalleh

Ehsan Hosseini

Hydrogen fuel cell-powered drones offer numerous advantages compared to battery-powered drones, such as longer flight times, lower emissions, and reduced operating costs. The development of hydrogen fuel cell technology for drones has progressed significantly in recent years, with improvements in fuel cell efficiency, power density, and hydrogen storage. This paper presents a review of the current status of hydrogen fuel cell-powered drones, including the latest developments in the field.

4:30 pm  
Brown 254

Blind Fighter – A Video Game  
for the Blind

Avery Harrah

Bhaskar Ghosh

Blind Fighter is a video game made to be playable by anyone, regardless of any visual impairments the player may have. The game relies on auditory cues to allow players to understand what is happening in the game without ever having to see the screen. The project's goal is to serve as a proof of concept that video games can be made inclusive with a few additions during development, without sacrificing overall quality. To do

this, the game features full graphics in addition to testing many strategies for visually impaired players, including direction-based audio, unique sound effects for each game action, dynamic music that changes with the state of the game, and various sound effects to display important UI elements, such as the player's health. Gameplay feedback was also taken from students at Arkansas Tech who played the game blindfolded to aid in the future development of Blind Fighter and to give a better understanding of what elements are most important to players when graphics are not a factor.

## Poster Presentations

Time & Location	Title	Presenters	Faculty Mentor
9:00 am Brown #1	Growing Up and The Emotions That Come With It	McKenzie Blanchard	Virginia Jones
<p>Many people roll their eyes when asked to read a twenty-plus page article and pull out key facts. They also usually do not pull out relatable emotions, but only information. When reading, though, whether poems or short stories, people do not mind the task because they get much more out of it. They walk away with feelings - ones they know from previous, personal experience, and also new ones which relate to the writer's own story. My work is an examination of stories of my past that have shaped me into who I am today. The stories are told from the heart - memories strong enough to stand the measure of time. The poems are to reflect the emotions I held. Some of the feelings resurfacing for the first time since, and some of the ones I have felt for what seems like for way too long now. My work is how I process these feelings. What do I want to say with my portfolio? You are human. Emotions are real - good, bad, ugly, sweet. You are stronger than you know, and you can handle when it seems like the world has put too much on your plate. I hope to inspire you to face your life head-on. Take the emotions and feelings as they come. Reflect on your life. Do not process to forget, but process to grow.</p>			
9:00 am Brown #2	Analysis of the Discrete Cosine Transform Coefficients	Dillon McKinley	Xinli Xiao
<p>In this report, the driving goal was to discover the relationship of the discrete cosine transform (DCT) coefficients to the original signal being tested through the correlations between amplitude and frequency within the frequency domain. Due to the complex nature of DCT's, the coding language Python was used to calculate the large matrices required to process signals into the frequency domain and generate graphs to represent them. To find the relationships between the DCT coefficients and the original signal, various manipulations were performed on the initial information. First, it was tested how varying the amount of samples taken for the discrete analysis of the signal would affect the coefficients being outputted. Then, taking the signal at different intervals was tested. Altering the lengths of the intervals would affect the period of the periodic extensions of the signal in which the DCT analyzes. Once the DCT is performed on the signal, the values of the amplitude at given frequencies are the coefficients used in the discrete cosine series that is used to reconstruct the original signal. It was found that altering the number of samples to a certain extent would limit the information that was required for reconstruction. Changing the interval taken from the original signal would change frequency where key amplitude for reconstruction would appear. It was also found that at certain intervals, the graph would spike on values that were not whole numbers which the DCT could not directly take a sample of, making the graph more erratic to compensate.</p>			
9:00 am Brown #3	The Effects on Children Raised in Single Parent Households	Kristen Brown Vivian Young Bryr Burton	Julie Mikles-Schluterman
<p>Societal structure is not built to support a single-parent household positively. This can be shown by research measuring children's development in poverty, the median household income of single parents, and food insecurities and obesity of children in poverty. The first goal of this research is to investigate the patterns of struggle that single-parent families experience in low-income households. These patterns of struggle in low-income households will include poverty, race/ethnicity, and child development (e.g., education). The second goal is to investigate the policies in place to help single-parent families and why they are inefficient in assisting them. These goals helped narrow down previous research findings that brought to the surface the disadvantages single-parent families experience, why stability is critical for child development, and how poverty can impact upbringing (e.g., food insecurities).</p>			
9:00 am Brown #4	Nicotine Use in College Students	Lora Brown	Rene Couture
<p>There is research on the long-terms effects on smoking tobacco cigarettes and has been globally known the damage it does to the human body. Anti-smoking propaganda and anti-drug promotions have circulated in education systems to educate young students on the harmful effects. As an alternative to tobacco cigarettes, vaping devices containing nicotine were introduced. Vaping rates of college students double in 2017-2018 and were advertised as a "safer" version of cigarettes (Raymond &amp; Kessler, 2021). The purpose of this study is to determine if the use of nicotine or vape devices on college students is related to stress relief, and how students are introduced to vaping.</p>			

9:00 am  
Brown #5

Physical and Chemical Mutation  
Induced in Bacteria to enhance  
Cr(VI) removal

Morganne Browning  
Erika Avalos-Reyes  
Harley Hines

Suparna Chatterjee

Chromium (VI) released as a result of industrial processes is mobile and highly toxic which can cause mutation and cancer (WHO, 2018). Our previous research showed bacteria reduced Cr (VI) to less toxic Cr (III) from synthetic solution and tannery effluents. Using natural biological agents and processes to degrade toxic pollutants is known as bioremediation. In this study we mutated *Escherichia coli* to induce heritable change in the DNA sequence. Ultraviolet radiation is used as a physical mutagen to cause mutation and produce strains that have the ability to enhance metal removal ability. Two mutants, UV1 and UV5 showed significantly more effectiveness for Cr (VI) reduction. We mutated *E. coli* using nitrous acid as a chemical mutagen and isolated strains to find their removal Cr(VI) removal efficiency. We will discuss our findings of the percentage of Cr (VI) removal by the mutants compared to the wildtype under laboratory conditions.

9:00 am  
Brown #6

Photoacid Generator

Natalie Buie  
Brisa Hernandez  
Cervantez

Rajib Choudhury

The use of metastable-state photoacids to initiate proton (H<sup>+</sup>) transfer and alter the pH of solutions allows for their potential use in many important acid-catalyzed reactions and also in the control of enzymatic reactions. In order to be a good candidate, a photoacid must present a sustainable change in pH and efficient timing of the forward and reverse reactions. These concepts were tested on a particular photoacid (PAH 1) which releases a proton in the presence of blue light irradiation and reversibly retakes that proton once no longer exposed to the light. Proof of proton transfer from PAH 1 will be presented, as well as the kinetics of the proton transfer and the stability of pH through many irradiation/recovery cycles. The data collected illustrates that PAH 1 does in fact release a proton upon irradiation. The proton is captured by a base and the fluorescence of the metastable intermediate is enhanced. The kinetics study presented a reverse reaction time of fifteen minutes in methanol. The irradiation-recovery cycles displayed that PAH 1 maintained about a 1.5-unit difference in pH between the irradiation and dark phases. Overall, the results demonstrated that PAH 1 is a prominent candidate for use as a metastable-state photoacid in altering biochemical reactions.

9:00 am  
Brown #7

Sustainable Camping Practices

Payton Millwood

Michael Bradley

Sustainable camping is when you make an effort to reduce your environmental footprint while camping. This can be done in many ways, from using energy-efficient electrical appliances, to solar powered generators, to utilizing more reusables over single-use plastic.

9:00 am  
Brown #8

Neighborly - A Community  
Website

Star Douangchanh

Susie Capehart

With social media's continuous growth, having a sense of community in the real world is decreasing. Neighborly is a website designed to bring people together to build a sense of community by offering a space to trade and barter their goods and services. Users will be able to connect with their neighbors to trade and barter, log exchanges, and share their experiences. To move through the experience, users will sign up for an account that will connect them with neighbors in their area. A profile will be created for each user to give information about what goods and services they offer. Users will then be able to connect with others in their surrounding area with the contact information provided and work an agreement out. After the experience, users will be able to log their exchanges in a form to keep track of their experiences. To build the website's frontend, I used HTML, CSS, and JavaScript. I designed the website so users could see the mission statement and sign-up on the home page. The next pages included a list of surrounding neighbors, an exchange log form, and a contact form. To connect my website to the database, I used PHP. This helped bring data from the exchange forms back to the website for users to view their logs. For the database, I used phpMyAdmin and XAMPP to connect to it. The database held all the user's information. I found that there are a lot of security and risk concerns with user profiles. In the future, it will be important to verify identities and locations. My hopes are that this website will promote socialization as well as help those who are struggling financially.

9:00 am  
Brown #9

Developing Understanding of  
Science Process Skills through  
Research and Practices

Faith Ebling  
Kyndal Smith  
Adria Lindeman  
Charlie Sawin  
Savanna Cessna  
Noelia Lopez

Suparna Chatterjee

The research examines our first-hand experience of conducting experiments in science and conceptualizing the experimental design process for teaching science concepts in elementary grades. We used *Drosophila*, the fruit fly as a model organism for studying the phenomenon that animals have traits inherited from parents. The phenomenon is a performance expectation in the Next Generation Science Standards (3-LS3-1). We observed the phenomenon, developed hypotheses, conducted experiments, collected data, analyzed and communicated our findings through



discussions and presentations. We utilized our knowledge acquired from the process in developing lesson plans for teaching in elementary grades. In this presentation we will discuss how developing understanding of science process skills through research benefited our teaching practices. We recommend explicitly discussing the nature of scientific inquiry and implementing hands-on opportunity to practice skills can help teachers develop and refine science teaching methods.

9:00 am Brown #10	Process of Designing and Building a Spectrometer	Tori Freeman	Jessica Young
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Spectroscopy is the study and measure of electromagnetic spectra resulting from electromagnetic radiation. When a light source of an unknown element is examined using a spectrometer, the unique element can be identified. The purpose of this project is to build a small hand-held spectrometer.

9:00 am Brown #11	The Effects of Bixa Orellana with the Addition of Different Fruit Vinegars to Stop Bacterial Growth in E.coli.	Yasmin Garcia	Chiraz-Soumia Amrine
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During this experiment two main components of B. Orellana were being researched, the biological and the chemical component. Throughout this testing period, the biological aspects of the B. Orellana berry were tested against bacteria to determine the plant's antibacterial properties. Two different types of vinegars were combined with B. Orellana berry and through several steps of extraction, evaporation, Defatting, and diluting, set concentrations of varying seed components were tested against E. coli. Several disks were placed on petri dishes containing each varying concentration along with two sets of controls, both negative and positive, to analyze the biological aspect's effectiveness.

9:00 am Brown #12	The Diet Of Greenside Darters (Etheostoma Blenniodes) From Mill Creek In The Ozark-St. Fracis National Forest	Alex Gillies	Kyler Hecke
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Understanding the diets of fish species is important for determining their niche requirements. Especially in Darters (Etheostomatinae), a group of fish species that we know very little about collectively. Currently, we know the diet of some darter species, but not how these diets are among species or within a species. The Greenside Darter (Etheostoma blenniodes) is one species that we do not know how its diet varies spatially. Further, we do not know much about the diet of Greenside Darters in Arkansas. We wanted to assess the diet of this species in a protected watershed to establish a baseline for diet. Greenside Darters were collected from Mill Creek, a tributary in the Illinois bayou watershed. We employed two sampling gears (kick-nets and seines) to collect this species in October (2022). Small-scale gastric lavage was used to extract diet data from all individuals. All prey items were preserved and identified to the genus level (if possible). Diet data was collected from a total of 36 individuals, with a median (range) length of 60 (42-81) mm. A total of 223 diet items from 5 orders were identified. There was a median of 7 (1-28) diet items per individual fish. A total of 10 unique prey item types were identified. Chironomids had the highest relative abundance (73%) among all prey item types. Greenside Darter diets described in Mill Creek are similar to previous diet studies on this species, suggesting that Chironomids are an important part of the Greenside Darter's diet. This study establishes a baseline of Greenside Darter diet data in Mill Creek, and provides a reference for future studies. Future research should look at how Greenside Darter diets vary on spatial and temporal scales.

9:00 am Brown #13	3D Printed Flying Car	Andrew Hood Joshua Phifer Nicholas Jones Ethan Jacobs	Robert Fithen
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For the project the goal is to build a 3D printed RC flying car with actuating wings. The purpose of this project is to show the possibility of modifying and adding 3D printed attachments for the purpose of having a multifunctional RC flying car. With a multifunctional 3D printed flying car, an end user could customize the flying car to their desired needs. The reason for choosing to build a flying car instead of just a plane or a car is that it is more versatile and there is nothing else like it available.

9:00 am Brown #14	Hydrogen Fuel Cell Powered Vehicle	Karyssa Locke Sutton Griffin	Seyed Hosseini
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Noah Knight

Hydrogen fuel cell technology has been around for many years. This technology is used by many large companies, such as NASA and DOT, in order to lower carbon emissions. Fuel cell technology does not only lower carbon emissions, but it is also more efficient than fossil fuels that are used today. This project has focused on building a lightweight fuel cell vehicle that has the possibility to improve air quality leading to an improvement in the quality of life. While working on the project, our team may have run into many issues, but in the end there is a definite improvement to the process when comparing it to the typical internal combustion engine vehicle.

9:00 am  
Brown #15

Kayak Automated Steering  
Project

Natalie Nyatsanza  
Jorge Garcia  
David Andres Asimbaya  
Solano  
Nicholas Gilbert

Mehmet Kelestemur

The proposed idea for this senior design project is to add an automated steering mechanism to control an electric trolling motor and adapt it to a personal kayak.

9:00 am  
Brown #16

The Effect of Chemical  
Composition on Thermal  
Conductivity

Dylan Moore  
Fisher Wagner  
Blake Andrews

Seyed Hosseini

Thermal paste materials are a vital component in the functioning of modern electronic devices, especially those with high-performance CPUs. These materials are designed to improve heat transfer between a device's CPU and the heat sink by filling the microscopic gaps between them, which can significantly impact device performance and lifespan. The effectiveness of thermal paste materials depends on several factors, including thermal conductivity, viscosity, and adhesive properties. The thermal conductivity of a material measures its ability to conduct heat, with higher values indicating more efficient heat transfer. Viscosity determines how easily the thermal paste can spread and fill gaps between the CPU and heat sink, while adhesive properties keep the paste in place and prevent it from drying out or separating from the surfaces it is applied to. Traditionally, thermal paste materials were made from metal oxide compounds, such as zinc oxide or aluminum oxide. However, newer formulations use a variety of materials, including ceramic and carbon-based compounds, to improve performance and longevity. These advanced thermal paste materials offer higher thermal conductivity, better adhesion, and longer lifespan, allowing for more efficient and reliable heat transfer. Thermal paste materials are a crucial component in the effective functioning of electronic devices with high-performance CPUs. With advancements in materials science and technology, thermal paste materials have become increasingly efficient, and reliable. By utilizing high-performance, sustainable thermal paste materials, manufacturers can ensure that their electronic devices perform at their best.

9:00 am  
Brown #17

Motion-Activated Cattle Sprayer

Mason Fulton  
Ethan Flud  
Kyle Lambert  
Brady Lyle

Randy Kelley

This research project aims to develop a motion-activated sprayer that dispenses insecticide onto cattle as they pass through the device. The sprayer will be designed to dispense insecticides that target common cattle pests such as flies, ticks, and mites that are capable of lowering the animals' health. This results in the animals becoming lethargic and stressed. Decreasing the cattle's activity and the amount of grazing they do. This lowered activity causes the cattle to lose weight and results in significant economic losses in the cattle industry. The sprayer will be equipped with a motion sensor along the coral to detect the cattle as they pass through, once detected the sprayer will trigger, dispensing insecticides on the top and sides of the cow. The project will focus on optimizing the sprayers design to ensure that the insecticides are delivered efficiently while simultaneously reducing the amount chemicals used. The performance of the sprayer will be evaluated through field trials and compared to the traditional method of hand spraying, the effectiveness will be based on the time taken to spray the cattle and the amount of insecticide used to treat them. The successful development and implementation of a motion activated sprayer has the potential to significantly improve the health and productivity of cattle, while reducing the amount of time needed and quantity of chemicals needed to treat them.

9:00 am  
Brown #18

Functional Integrated Storage  
Housing

Christopher Dew  
Noah Disheroon

Jacob Weidenfeller

The vertical rotating shelf is a new design concept for a robotics laboratory that provides a compact and efficient storage solution for a variety of components and materials. The shelf is designed to maximize storage capacity while minimizing the amount of space required. The shelf consists of a sturdy metal frame with multiple shelves attached to it. The shelves are modular and the bins on the shelves can be changed to accommodate

items of varying sizes. The rotating mechanism is powered by a motor, which allows for easy access to all items on the shelf without having to move or reorganize the entire storage area. The shelf is ideal for use in a robotics laboratory, where space is often at a premium and storage needs are constantly changing. The compact design of the shelf allows for easy installation in a variety of settings, including on a workbench or in a corner of the lab. The rotating feature also enables efficient organization of materials and components, reducing the time and effort required to locate specific items. Overall, the vertical rotating shelf is a practical and innovative storage solution for a robotics lab that provides a unique combination of space-saving design and efficient organization capabilities. Its sturdy construction, adjustable shelves, and rotating mechanism make it a versatile and reliable addition to any lab looking to optimize their storage capabilities.

9:00 am Brown #19	Survey and Risk Assessment Drone	Jose Cervantes Aaron Severs Xayphone Phomsithi Alex Nguyen Austin Rankin	Mehmet Kelestemur
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This project entails a survey drone that will be used to provide a reliable and quick risk assessment report that could be used rather than land survey equipment. The drone will be designed to fly survey missions using an onboard GPS system, during the flight the drone will be taking pictures that will be used for a 3D rendering. The design will consist of a custom flight control system for control over the drone, and a custom efficient body, both specified for the objectives the drone will be completing. Once the survey mission is complete the images taken during flight will be uploaded to a 3D rendering software to create an accurate 3D map of the surveyed land. This 3D rendering will then be used to simulate different aspects of the landscape to write a detailed description of the land for a consumer.

9:00 am Brown #20	NASA Hydrogen Flame Demonstration	Stephen Baker	John Krohn
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The Hydrogen Flame Demonstration project encompasses the design, fabrication, and usage of a pressure vessel system with the goal of demonstrating the hazardous flammable properties that are associated with gaseous hydrogen. This project was completed as a part of a 16-week internship at the NASA White Sands Test Facility in Las Cruces, New Mexico during the Spring of 2022. As the interest of technologies using hydrogen as a fuel, or otherwise, increases, informing and setting ‘best practices’ for use of pressure systems containing hydrogen becomes increasingly necessary. Gaseous hydrogen is highly flammable with the presence of air or oxygen. Since the minimum ignition energy (MIE) of a stoichiometric mixture of hydrogen with air is exceptionally low at 0.017 mJ[1], the lower flammability limit of hydrogen in air is only 4% by volume[2], hydrogen flames in air are invisible to the naked eye, and the size of the hydrogen molecule is small which makes it prone to leakage, common failure modes of hydrogen include deflagration, detonation, and non-visible flames. However, the technologies associated with hydrogen as a fuel are promising and could be the solution to climate change issues. To unlock the potential of hydrogen-based technology, researchers, engineers, and handlers that associate with such technologies should be informed and design for the hazards involved. This project demonstrated the characteristics of a hydrogen flame with in-person demonstrations, high quality video of the demonstrations, and will serve as the foundation of future experiments to investigate hydrogen flame properties such as auto-ignition conditions in collaboration with the US Department of Energy.

10:15 am Brown #1	Gearbox	Mohammed Al Omairi Ibrahim Alshammari Nawaf Alshammari Abdullah Aljohani Hezam Al Marri	John Krohn
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In this project, we are designing and fabricating a gearbox. While doing any project the most important part of the project is the use of its resources. The most important resource for any project is its cost and time. The preliminary budget of the project is also assembled so this design can be made as cheaply as it can. There are two main aspects of an engineering project. First are its technical specifications and a way to fulfill those specifications. The second thing is how this project is managed with the non-technical things such as safety, health, environment, etc. both of these aspects of the project are shown in this project. In the end, the discussion goes towards the different standards of the gearbox that will be followed during this project.

10:15 am Brown #2	The Aerocap Aerodynamic Attachment for Pickup Trucks	Andrew Tucker David Silk	Mohammed Amjadi
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As the pickup truck continuously becomes more popular in both commercial and family applications, the fuel efficiency of modern pickup design should be brought into question. According to CBS News, pickup trucks accounted for around 20% of all new vehicles sold in America in 2022, with the three most popular vehicles sold during the year all being pickups. However, these vehicles consistently have higher drag coefficients than other types of vehicles, namely sedans or crossovers. This leads to decreased fuel economy and more overall greenhouse gas emissions.

Even in the case of an electric pickup truck, the high drag coefficient may lead to decreased range when compared to other electric vehicles. It has long been known that this inherent lack of aerodynamic efficiency is largely caused by the bed of the pickup truck, which tends to create a large low-pressure pocket of air, leading to increased drag. This has caused many manufacturers to design solutions such as the tonneau cover, and the camper shell. While these designs are good for utility, they leave room for improvement in aerodynamics. This project aims to further research on a lesser-known bed cover for pickups: the aerocap. A design will be proposed and tested using Computational Fluid Dynamics (CFD), a scale model in a wind tunnel, and a full scale model. Under preliminary CFD testing, the planned design yielded a 15% decrease in the drag coefficient of a pickup when compared to an uncovered bed. The proposed design will increase the aerodynamic efficiency of the truck in question while also not compromising the utility of the truck.

10:15 am  
Brown #3

Working Students and their  
Academic Performance

Journi Goforth

Rene Couture

The purpose of my study was to compare the academic performance of working students and non-working students and examine the effects of being a working student at a mid-sized public university in the south. The participating students are students enrolled in a required Orientation to the University courses for the Spring 2023 semester. Students in the orientation classes received an email and Blackboard announcement inviting them to complete a short voluntary study. The aim of the survey was to collect data about how many of the students are employed, why they work, how many hours a week they typically work, what range their GPA falls in, and if they believe working or not working influences academic performance. The GPAs of the working and non-working students were compared to see if there was a statistically significant difference.

10:15 am  
Brown #4

The Fight for King of Efficiency

Sutton Griffin

Matthew Hankins

The automotive industry is plagued with the question of how automobiles can be altered to reduce emissions and provide a way to counter the ever-increasing gas prices. The issue presented to auto manufacturers was to invent a drive system that can satisfy the call of environmentalism and satisfy the market trends such as luxury, sportiness, and economy. The industry responded with three different approaches to this issue: the hybrid electric vehicle (HEV), the battery-electric vehicle (BEV), and the hydrogen fuel cell electric vehicle. In 2005, the second-generation Toyota Prius was put into nearly every vehicle that Toyota offers and has even made the gas mileage for its full-size truck, the Tundra, get up to 20 miles per gallon city and 24 miles per gallon highway. This vehicle would be the start of the entire automotive industry switching to all-electric vehicles that support a similar range to their hybrid alternatives. This is what led to our 21st-century pull for daily drivable electric automobiles.

10:15 am  
Brown #5

Getting Started with Inquiry-  
Based Teaching and Learning

Raelynn Hall  
Avery Farmer  
Madison Howerton  
Ramya Hardaway

Suparna Chatterjee

Inquiry-based instruction refers to different ways we study the natural world, practice to ask and try to answer a scientific question, and propose explanations based on the evidence derived from conducting experiments. For this study we engaged in developing science process skills by actively conducting research using *Drosophila*, the fruit fly as a model organism for studying the phenomenon that animals have traits inherited from parents. The phenomenon is a performance expectation in the Next Generation Science Standards (3-LS3-1). We observed the phenomenon, developed hypotheses, conducted experiments, collected data, analyzed and communicated our findings through discussions and presentations. We developed lesson plans using inquiry-based instruction from our first-hand experience of engaging with it in our research. We will discuss how teachers scaffold guide the inquiry and how inquiry-based instruction supports active learning.

10:15 am  
Brown #6

Perception of Representation

Kristin Hardy

Jason Warnick

This research project aims to reveal the discrepancies between Arkansas Tech students' perception of racial representation. The intention is to inspire institutional leaders to resume the second phase of their 2018 "Strategic Plan for Inclusive Excellence". In this study, 119 undergraduate students were surveyed to analyze their perceptions of social, administrative, and educational support by race. The results of Likert-type scale questions revealed significant discrepancies in each question section. Interesting findings included a trend of Caucasian and African/African American populations favoring opposing ends of the scale with the Asian/Asian American and Hispanic populations favoring the middle. Also, the average score for Caucasian populations was lower than originally anticipated. This may signify a realization that ATU does not represent other racial groups as well as the Caucasian population.

10:15 am  
Brown #7

The Effects of Income Levels on  
General Health in Arkansas

Stephanie Harris  
Hannah Jobe

Julie Mikles-  
Schluterman

## Counties

Sarah Hooten

The present study seeks to answer the question of what effect income has on general health factors, specifically obesity, low health literacy, and life expectancy, in Arkansas counties. The study takes on a secondary analysis approach, using data collected through the Arkansas Department of Health. The hypothesis is that as income increases, general health will also increase. Higher income will mean lower rates of obesity, lower rates of low health literacy, and higher life expectancy.

10:15 am  
Brown #8

The Effects of Tutoring on  
Retention Rates in Higher  
Education

Sarah Henry

Rene Couture

Retention rates within higher education are the largest indicators of institutional success. Because of this, knowing the factors that correlate with retention should be invaluable to universities of all types. The current study is focused specifically on tutoring, an academic service which has been found to be significant in the past in reference to increased retention rates at other universities. In this study, I use pre-existing data of tutoring attendance and re-enrollment at Arkansas Tech University in order to determine whether the two correlate. The data analysis and results of the study will be available by April 12. The largest emphasis of this study is the future implications of these results. This study could be a valuable starting point for studying the causal factors behind fluctuating retention rates.

10:15 am  
Brown #9

Photoacid Generator

Brisa Hernandez-  
Cervantes  
Natalie Buie

Rajib Choudhary

The use of metastable-state photoacids to initiate proton (H<sup>+</sup>) transfer and alter the pH of solutions allows for their potential use in many important acid-catalyzed reactions and also in the control of enzymatic reactions. In order to be a good candidate, a photoacid must present a sustainable change in pH and efficient timing of the forward and reverse reactions. These concepts were tested on a particular photoacid (PAH 1) which releases a proton in the presence of blue light irradiation and reversibly retakes that proton once no longer exposed to the light. Proof of proton transfer from PAH 1 will be presented, as well as the kinetics of the proton transfer and the stability of pH through many irradiation/recovery cycles. The data collected illustrates that PAH 1 does in fact release a proton upon irradiation. The proton is captured by a base and the fluorescence of the metastable intermediate is enhanced. The kinetics study presented reverse reaction time of fifteen minutes in methanol. The irradiation-recovery cycles displayed that PAH 1 maintained about a 1.5-unit difference in pH between the irradiation and dark phases. Overall, the results demonstrated that PAH 1 is a prominent candidate for use as a metastable-state photoacid in altering biochemical reactions.

10:15 am  
Brown #10

Tsh and CtBP Interaction  
Coordinates Drosophila eye  
Development

Harley Hines  
Raven Newton

Surya Banerjee

Transcription regulation controls the eye precursor cell division, followed by photoreceptor specification in the larval eye precursor tissue called the eye disc of Drosophila, the fruit flies. In the third instar larval eye disc, a morphogenetic furrow (MF), demarcates anterior dividing cells from the posterior differentiating cells. Teashirt (Tsh), a transcription factor induces cell division, and C-terminal Binding Protein (CtBP), a transcription coregulator, limits cell division in the eye disc. They have overlapping expression patterns in the eye disc. Our hypothesis is that Tsh and CtBP bind with each other and control eye development. We show that Tsh and CtBP molecules interact in vitro and in vivo in using pulldown assays. We further want to evaluate the role of such interaction on eye development using the fly genetics. The result can help to identify the molecular processes of eye development regulated by the conserved Tsh and CtBP together in the metazoans.

10:15 am  
Brown #11

Creating a Primitive Campsite

Colton Hobbs

Michael Bradley

What is a primitive campsite and how can they help

10:15 am  
Brown #12

The Health Benefits of Kayaking  
and Canoeing

Abby Hodges

Michael Bradley

The health benefits of kayaking or canoeing are both mental and physical. It is a low impact cardiovascular workout. Throughout the years more and more information has surfaced because different circumstances are providing different beneficial results.

10:15 am  
Brown #13

Machine Learning On  
Supersaturated Regions of the  
Galactic Center

Andrew Hogue

Matthew Hankins

The SOFIA observatory has recently conducted an imaging program to study the brightest infrared portions of the center of our galaxy. These data provide an important view of this interesting region which contains numerous dusty clouds, stellar clusters, as well as a supermassive black hole. Archival imaging observations of this region at ~24 microns from the Spitzer mission as well as WISE are both badly saturated. In order to leverage the high sensitivity of Spitzer with the better bright source performance of SOFIA, we are working to create a machine-learning model to properly combine both data sets into a 24 micron map of the region. Early models trained on point-source datasets yield a 71% success rate. Further iterations, with subsequent models for specific classifications of datasets, will see even higher success rates. With more successes, these models will be of great use to many other scientists seeking to predict star cluster maps with super-saturated regions.

10:15 am  
Brown #14

The Effects of Income on  
General Health in Arkansas  
Counties

Sarah Hooten  
Stephanie Harris  
Hannah Jobe

Julie Mikles-  
Schluteran

The present study seeks to answer the question of what effect income has on general health factors, specifically obesity, low health literacy, and life expectancy, in Arkansas counties. The study takes on a secondary analysis approach, using data collected through the Arkansas Department of Health. The hypothesis is that as income increases, general health will also increase. Higher income will mean lower rates of obesity, lower rates of low health literacy, and higher life expectancy.

10:15 am  
Brown #15

The Hall Effect

Zachary Stephens  
Riley Lane

Jessica Young

The Hall Effect is a phenomenon in physics. The Hall Effect is the consequence of a perpendicular magnetic field crossing an electric current. The Results of the phenomenon are the Hall Voltage, along with the Hall Voltage other important values are to be discovered. The Hall Coefficient, a result from the number of carrier charges and the hall voltage. And also the drift velocity of the electrons inside the current. We will discuss and show the Hall Effect and their resultants.

10:15 am  
Brown #16

The Effects of Income on  
General Health in Arkansas  
Counties

Hannah Jobe  
Stephanie Harris  
Sarah Hooten

Julie Mikles-  
Schluteran

The present study seeks to answer the question of what effect income has on general health factors, specifically obesity, low health literacy, and life expectancy, in Arkansas counties. The study takes on a secondary analysis approach, using data collected through the Arkansas Department of Health. The hypothesis is that as income increases, general health will also increase. Higher income will mean lower rates of obesity, lower rates of low health literacy, and higher life expectancy.

10:15 am  
Brown #17

Spatiotemporal Comparison Of  
Redfin Darter (*Etheostoma  
Whipplei*) Diets From Two  
Spatially-Distinct Streams In The  
Arkansas River Valley

Ben Johnson

Kyler Hecke

Diet-data collection is increasingly difficult for darters, as most methods require the dissection of each specimen and the removal of the digestive tract. In result, the diets of many darter species have been relatively understudied. The Redfin Darter (*Etheostoma whipplei*) is one species where there is very little information on its diet. We wanted to use a non-lethal diet extraction method to assess how the diet of this species seasonally varied between two spatially-distinct streams, Bakers Creek and Shoal Creek, tributaries of Lake Dardanelle (Arkansas River). We employed two sampling gears (kick-nets and seines) to collect this species in October and January-February. Small-scale gastric lavage was used to extract diet data from all individuals at two different streams. All prey items were preserved and identified to the genus level (if possible). A total of 176 different prey items from 17 fish (37-69 mm), covering 10 orders were extracted from Redfin Darters sampled in Bakers Creek during October (2022). During January, a total of 227 different prey items from 20 fish (36-68 mm), covering 7 orders were extracted from Redfin Darters in Bakers Creek. In Shoal Creek, a total of 187 different prey items from 18 fish (32-67 mm), covering 10 orders were extracted from Redfin Darters sampled. During February, a total of 227 different prey items from 16 fish (33-70 mm), covering 8 orders were extracted from Redfin Darters in Bakers Creek. Diets from both streams were comprised mostly of Chironomids, suggesting this prey item is an important part of Redfin Darter diets. There appears to be no spatiotemporal differences in Redfin Darter diets between these two streams, implying that these two streams support similar aquatic-macroinvertebrate communities. This research is will aid in the understanding Redfin Darter diets, by

establishing a baseline of their diet, and how it varies spatiotemporally.

10:15 am Brown #18	Research for future public health emergencies for city of Guangzhou	Shimin Su	Julie Mikles-Schluterman
<p>This research study underscores the importance of preparedness for the City of Guangzhou to enhance response capabilities related to disease outbreaks. By reviewing existing literature, this study examines preparedness and response activities adopted by various countries during the COVID-19 Pandemic and further provides strategies to reduce impacts and facilitate effective response and recovery for future public health emergencies.</p>			

10:15 am Brown #19	The Design and Environmental Impact of a Renewable Energy Powered Boat	Karyssa Locke	John Krohn
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The study of alternative energy sources has accelerated over the years. Further investigation of alternative energy sources is important for reasons that are unknown and unthought about by people around the world. Many sources of energy that are not renewable energy sources are harmful to the environment and are causing a high rise of greenhouse gas emissions. If society would learn more about the increase of greenhouse gas emissions and the effects it has on the environment, then there could be a drop in carbon emissions. Transportation has been one of the largest sectors of greenhouse gas emissions and has not seen a large enough decrease to be substantial enough to better the environment. The transportation sector of the greenhouse gas emissions could be easily fixed with the use of hydrogen fuel cells or battery electric vehicles. The idea of fuel cell and battery electric cars has been around for decades, but has only recently become popular. The increase of these vehicles will cause a decrease in harmful greenhouse gasses produced by transportation. A large issue still stands with other vehicles such as airplanes and boats. Seventy-one percent of the earth is covered with water. This means that if boats were to change to only use renewable energy sources, then the aquatic environment would become less harmful to the plants and animals that live in it. Boats may not take up the largest part of the transportation sector, but the harmful emissions that come from aquatic vehicles still affect the environment in ways that need to be changed.

10:15 am Brown #20	Chemical and Biological Investigation of Sambucus canadensis and Salvia officinalis.	Elizabeth Martin	Chiraz-Soumia Amrine
<p>New treatments for cancer and bacterial infections are needed, especially because most patients acquire resistance to conventional first-line treatments. Many natural product metabolites exhibit potent activity. Sambucus sp., elderberry, and Salvia sp., or sage, are well-known shrubs for their therapeutic benefits. This study aims to analyze how secondary metabolites are extracted from the native American Elderberry, Sambucus canadensis, and Sage, Salvia officinalis. It also aims to investigate the process of vinegar baking of medicinal plants to enhance the chemical space and increase the biological properties. Vinegar baked and non-vinegar baked elderberries and sage were utilized to test this theory. A Soxhlet extractor was used to extract the medicinal molecules. A rotary evaporator and a separatory funnel were required for many liquid-liquid extraction steps. The samples are subjected to Gas chromatography coupled to a mass spectroscopy GC-MS to identify the secondary metabolites. Our preliminary results show an improvement in the antibacterial activity of both the elderberries and sage baked in vinegar extract compared to the raw organic extract.</p>			

11:30 am Brown #1	A Research Appraisal of how Electronic Health Record Implementation has Impacted Coding Efficiency	Abby Phillips Jasmine Ware	Georgeanna Wright
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This research project highlights the ways that coding efficiency has been improved in healthcare over the years, with an emphasis on EHR implementation. This research project references and analyzes trends concerning coding and the revenue cycle from credible and reliable sources. In this research study, we will reference articles that analyze trends and create a visual understanding of the data collected. This study will highlight a broad spectrum of the impact of electronic health record implementation in the healthcare setting. (Tsai et al., 2020)

11:30 am Brown #2	Critical Appraisal: Do MS-DRGs Financially Impact Highly Volumned Admissions in Post-acute/ Acute Care Hospitals?	Jalynn Bottoms Kinlee Runnels Megan Tyler	Georgeanna Wright
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The purpose of our research is looking at Medicare Severity- Diagnosis Related Groups (MS-DRGs) is to categorize Medicare patients into various groupings based on the attributes of their hospital stay. Medicare bases their payments on these MS-DRGs, rather than the hospital length of stay. The article Financial Impact of MS-DRG conversion for high-volume admissions focuses on investigating the Medicare payments on the five most prevalent DRGs and whether savings occur for both the hospital and the Medicare Program.

11:30 am Brown #3	Antibacterial Activity of Native Plants in Arkansas	Kayla Medina Raven Turner Katie Huffman	Suparna Chatterjee
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American beautyberry (*Callicarpa Americana*), Sugarberry (*Celtis laevigata*) and Red buckeye (*Aesculus pavia*) are native plants of Arkansas. Plant families with species having high chemical compounds can have antimicrobial properties. In this study, the antibacterial properties of the plants are investigated against three gram positive (*Bacillus cereus*, *Bacillus subtilis*, and *Staphylococcus epidermidis*) and three negative bacteria (*Alcaligenes faecalis*, *Escherichia coli*, and *Serratia marcescens*). The disc diffusion assay method is employed to identify any potential antibacterial properties of the plants. For this experiment, 6.41 g of dehydrated plant material (leaves for both species) was combined with 50 mL of 75% ethanol creating their respective tinctures which were processed to remove alcohol and make powder samples. The antibacterial activity of the powders in sterile Milli-Q water was tested against 75% ethanol and hydrogen peroxide controls. After 24 and 48 hours of incubation at 37°C the zones of inhibition were measured for each bacteria/plant sample combination. The three species of plant samples were tested for inhibition for the six bacteria. One-way ANOVA (analysis of variance) results showed that to examine the effect of different concentrations of plant samples and two different incubation times (24h and 48h) of each plant species on zones of inhibition for six different bacteria. Sugarberry and Red buckeye (leaves) showed antibacterial effects, however, the effect was less compared with commercial antibiotics (Erythromycin and NA30). American Beautyberry has an antibacterial effect comparable to commercial antibiotics. All species leaf extracts did not differ on their antibacterial properties on gram positive and gram-negative bacteria.

11:30 am Brown #4	Research Appraisal of Hand Hygiene and Reducing Ventilator-Associated Pneumonia in Critical Care Settings	Francesca Deal Madison Deal	Georgeanna Wright
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Currently, one of the main focal points of healthcare is to control the spread of infectious diseases and one of the primary areas is in the prevention of the spread of nosocomial infections within the healthcare setting. The purpose of this study is to view the correlation between hand hygiene education and practices and the reduction of Ventilator-Acquired Pneumonia (VAP). The study resulted in a decreased level of VAP infections after implementation.

11:30 am Brown #5	Spatial Assessment Of Aquatic Macroinvertebrate Communities In Tributaries Of Lake Dardanelle.	Kade Mitchell	Kyler Hecke
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The monitoring of aquatic macroinvertebrates is important for depicting change in the health of aquatic ecosystems. Aquatic macroinvertebrates are sensitive to environmental change, resulting in them being great biological indicators. However, spatial relationships are rarely assessed in aquatic macroinvertebrate communities, especially in Arkansas. We wanted to assess spatial relationships of aquatic macroinvertebrate communities in tributaries of Lake Dardanelle. Aquatic macroinvertebrate communities were sampled from 6 different sites (Big Shoal Creek, Bakers Creek, Hurricane Creek, Middle Fork Illinois Bayou, Mill Creek, and Spadra Creek) along tributaries of Lake Dardanelle from January 2022 until February 2023. D-frame kicknets were used to sampling aquatic macroinvertebrate individuals. All collected individuals were identified down to genus, if possible. Communities were assessed with various diversity indices (Shannon and Simpson), and Bray-Curtis dissimilarity. A total of 45 unique species were observed from all sites. Heptageniid mayflies (101) were the most abundant aquatic macroinvertebrate among all sites. Spadra Creek was the most diverse site, with 24 unique species observed. On average (mean ± sd) Shoal Creek (0.76 ± 0.29) and Bakers Creek (0.69 ± 0.27) were more dissimilar with all sites than Hurricane Creek (0.58 ± 0.24), Middle Fork Illinois Bayou (0.56 ± 0.23), Mill Creek (0.64 ± 0.26), and Spadra Creek (0.64 ± 0.26). Spatial differences exist in aquatic macroinvertebrate communities among tributaries of Lake Dardanelle. These differences may be due to different landuse types within the respective watershed for each of these creeks. This data provides a bases for understanding the aquatic macroinvertebrate communities among Lake Dardanelle tributaries and how they spatially vary.

11:30 am Brown #6	Hydrogen Fuel Cell Quadcopter	Dylan Moore	Randy Kelley
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A fuel cell drone is an unmanned aerial vehicle (UAV) that uses a fuel cell as its power source. Fuel cell drones are gaining popularity as an alternative to traditional battery-powered drones, as they offer longer flight times, higher payload capacity, and lower environmental impact. The fuel cell in a drone works by converting hydrogen and oxygen into electricity through an electrochemical reaction. This produces water vapor and heat as byproducts, making fuel cell drones much cleaner and quieter than their combustion engine counterparts. In addition, fuel cell drones can be refueled much faster than battery-powered drones, as they only require a supply of hydrogen gas. One of the main advantages of fuel cell drones is their longer flight time. While battery-powered drones typically have flight times of 20-30 minutes, fuel cell drones can fly for several hours on a single tank of hydrogen. This makes them ideal for applications such as aerial surveys, inspections, and monitoring, where long flight times are required. Fuel cell drones also have a higher payload capacity than battery-powered drones, as the fuel cell and hydrogen tanks are typically lighter than the equivalent battery capacity. This allows fuel cell drones to carry heavier sensors or equipment, making them useful for tasks such as crop spraying or cargo delivery. However, fuel cell drones are currently more expensive than battery-powered drones, as the technology is still in its early stages of development. In addition, the infrastructure for hydrogen refueling is limited, making it difficult to operate fuel cell drones in remote or inaccessible areas. Overall, fuel cell drones offer an exciting opportunity for the future of UAVs, with the potential to revolutionize countless industries. As the technology continues to develop and become more affordable, we can expect to see more fuel cell drones taking to the skies.

11:30 am  
Brown #7

Alleviating Environmental  
Stresses in Native Arkansas  
Plants by Arbuscular  
Mycorrhizal Fungi Inoculation

Rebecca Morse

Suresh Subedi

The rapid human-driven changes in the environment during the Anthropocene have placed extreme stress on many native plants and animals. Beneficial interactions with microorganisms may be crucial for ameliorating these stressors and facilitating the ecosystem services host organisms provide. The role of an important mutualistic association with arbuscular mycorrhizal fungi (AMF) in the competitive ability and successful adaptation of Arkansas native species by enhancing nutrient uptake has not been previously considered. Analysis of field root and soil samples from the native species in their native range as well as a controlled greenhouse experiment will be conducted to determine the level of mycorrhizal colonization in the roots of native plants and the dependency on mycorrhizal fungi for growth and nutrient uptake. The field root samples are expected to show that native plant species are heavily colonized by AMF in relatively dry conditions compared to mesic or wet sites. The results from the control growth experiment will check whether the mycorrhizal treatment plants have significantly higher relative growth rates and biomass compared to the non-mycorrhizal plants. The dependence of native species on the mycorrhizal fungi for growth and nutrient uptake based on habitat conditions will also be examined. Given the importance of native species for ecosystem services, findings from this study may be critical for the conservation and successful restoration and management of native plants and their habitats in Arkansas.

11:30 am  
Brown #8

Hospital Price Transparency of  
Acute Care Hospitals

Raegan Parker  
Kylie Moore

Georgeanna Wright

A rule implemented by Centers for Medicare & Medicaid Services (CMS) in January 2021 states that acute care hospitals are required to post online a machine-readable file that makes changes in hospital price transparency. It aims to improve the affordability of hospital care by promoting price competition. The hospitals that are compliant with the Hospital Price Transparency Final Rule will facilitate online price shopping for patients by making prices for services available. We reviewed the research to explain the purpose of determining how compliant acute care hospitals have been with the Hospital Price Transparency Final Rule since its implementation. A cross-sectional observational study found that 55% of the 3,558 Medicare-certified acute-care hospitals had not posted a machine-readable file. We reviewed research and found that hospitals aren't compliant with the Final Rule which would compromise the effectiveness of this regulation.

11:30 am  
Brown #9

Mycotoxins in Cattle

Jaid Villines  
Luke Shelton

Tatum Simms

With many opportunities for mycotoxin development, mycotoxicosis continues to be a problem within the cattle industry. Mycotoxin development can occur during any point in plant growth, processing, and storage. Due to the chemical and thermal stability of various mycotoxins, feed processing can have little effect on mycotoxin removal. Along with this, improper storage of processed feeds can allow for mold growth and mycotoxin formation. Mycotoxins can adversely affect cattle production and health, causing major losses in profits. Regular testing and precautions should be taken to prevent further contamination and loss of livestock. This research provides general overviews of the fungal strains that produce mycotoxins, what crops they affect, the adverse health effects mycotoxins have on cattle, how to recognize potential contamination, how to test for mycotoxins, and how to prevent mold growth. The purpose of this research is to provide a basic summation of current literature on mycotoxins to be used as a foundation for further experimental research.

11:30 am  
Brown #10

Organic Farming in Arkansas -  
Extensive Labor for Expensive  
Labels

Kinley Hays  
Virginia Slick  
Isaac Duran

Tatum Simms

The demand for organically produced items has exponentially increased over the last decade. This demand has driven the push for farmers across the world to transition from traditional methods of production to those that follow the guidelines for organic production. This form of production is not always profitable for the farmers themselves due to increased yield loss from pests and environmental pressures. The purpose of this paper is to attempt to answer the question of whether or not organic production is profitable within the state of Arkansas. In order to answer this question in the best way possible, crops produced in Arkansas were split, depending on how they are delivered to the final consumer, into three categories: fresh produce, bulk grain, and processed products. Each category was then assigned a crop to represent it for this research. Strawberries were chosen for fresh consumption, rice for bulk consumption, and soybeans for crops consumed in processed forms. Once the available sources were compiled and analyzed, it was found that much of the information needed to determine the true profitability of organic production is not available for the state of Arkansas. The data that was collected showed that for both strawberries and rice the final price was higher for organically produced crops. No data on organic soybeans was available for the state. Further research is required in order to be able to determine whether or not organic production within the state of Arkansas is profitable to the point of encouraging farmers to make the switch from conventional methods to organic practices in the near future.

11:30 am  
Brown #11

Benefits of Using Growth  
Hormone Implants in Beef Cattle

Brody Jones  
Jaxsen Franco  
Riley Knight

Tatum Simms

Using growth hormone implants in beef cattle producers could combat the decreasing market supply that is currently being experienced in the United States (US). Growth hormone implants increases individual cattle weight by 15 to 20 percent, produces the same amount of product using fewer head of cattle. This study provides an insight into the benefit of using growth hormone implants in the production of beef cattle. The paper takes a look at the rising costs of input prices, cattle market supply in the US, and the effects these implants had on beef cattle of varying species and environments. Most of the results are compared using the average daily gain of the cattle and the impact the implants had on feed efficiency. The study was primarily based on analyzing published research by various institutions and independent studies. The results of this research showed that in almost every case growth hormone had a positive impact on both average daily gain and feed efficiency. It was found that on average the cattle implanted saw an increase of 15-20 percent in their average daily gain and around a 6 percent increase in their feed efficiency. It is recommended that further research be conducted on different areas of implantation as the ear provides producers minimal room for error.

11:30 am  
Brown #12

Medicinal Use of Cannabis in  
Canines

Tailor Kimbriel  
Claire Manns  
Hannah Horst

Tatum Simms

Medicinal cannabis continues to gain popularity for treating a variety of health issues for both humans and animals. This paper examines this growing trend and looks closer at the benefits canine cannabis offers in veterinary care. Cannabis has been viewed in a negative light due legal and safety concerns. However, research has shown medicinal cannabis offers multiple benefits such as chronic pain management, epilepsy management, and anti-inflammatory properties. Surveys were created to gain both veterinarian and community viewpoints on the use of cannabis for canine health.

11:30 am  
Brown #13

Food Inflation in Pope County

Hayden Garrett  
Will Uchtman  
Ty Gray  
Stephanie Littlefield

Syed Meerza

Although inflation is cooling off in many sectors of the US economy, food inflation continues to surge, indicating the volatility of the agri-food system. The higher food prices make it difficult for US consumers to afford everyday essential food products. The main objective of this research is to calculate food inflation in the pope county area. We utilized the consumer price index (CPI) to measure the change in prices paid by pope county consumers for food. Our preliminary analyses show that food prices in pope county are easing. Specifically, the food inflation rate in pope county declined in March 2023 compared to January 2023.

11:30 am  
Brown #14

Avian Influenza in the United  
States and its ramifications on  
our market and in the poultry  
industry.

Alaini Carrington  
Savannah Sanders  
Jada Trotter

Tatum Simms

Avian Influenza (AI) in the United States, has significantly impacted 47 states. There are four main AI types have an impact on poultry farms. Avian Influenza can be reduced by taking preventative methods such as biosecurity and culling birds to maintain a healthy flock on the farm. Since 2022 egg-laying hens have been affected by the Avian Influenza Virus, causing egg inventories to become lower. Highly Pathogenic Avian Influenza (HPAI) has affected farmers tremendously; because of this, farmers now have to worry about their families' source of income, their workers and the workers' families' source of income, and job loss. Once a flock has Avian Influenza, the farm must go out of commission for an

extended time. Based on the results of this study, Avian Influenza has caused a loss in the poultry industry, affecting farmers leading to a severe loss of income due to low production outputs. The Avian influenza outbreak is also affecting consumers because they cannot or must reduce the amount of meat or egg products they purchase since prices are too high in grocery stores. Publicly available data from journal articles and disease monitoring websites were used to gain a good representation of the disease spread across the poultry industry. These methods have proved to cause a fast turnover in the poultry industry. Overall, Avian Influenza has impacted the United States by affecting the economic growth within the poultry industry. This horrific outbreak has caused a loss in profit for farmers and has caused substantial increases in egg prices for consumers.

11:30 am Brown #15	Utilization of Beta-Agonists on the Effects of Marbling / Fat Deposition in Beef Cattle	Rafael Andrade Blaine Holzman Sara Erby	Tatum Simms
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In the beef industry, producers have tried to find ways to optimize production and performance for the benefit of their beef cattle operations. In order to do that, if they wished to, they would use modernizing technologies that are available today. With modern technologies, such as Beta – androgenic agonists, producers have been able to utilize these to see the positive effects of marbling and fat deposition. They act to enhance lean muscle gain, increase growth rate in the animals, and increase feed efficiency without having to use extra inputs. The use of these technologies has been a major contributor to the safe, wholesome, and affordable beef supply in the United States. This research seeks to explore the concerns that consumers have about using these technologies, and there are concerns about side effects. Other producers prefer to use implants after seeing an increase in Hot Carcass Weights at sale. Higher weights at sale turn into profit, which also provides more fresh, safe, and healthy meat for consumers. Comparatively speaking, animals administered Beta-Agonist and those without, animals show much higher production rates and more efficient gain after the intake or implantation of the drug. With the drastic difference of feed efficiency and compensation of gain, beta-agonist can be and have been a saving grace for producers in difficult times when the feed or beef economy is unforgiving.

11:30 am Brown #16	Natural Effects on Arkansas Waterfowl	Caleb Sipes Ellison Stephens Marissa Young	Tatum Simms
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Waterfowl hunting has been a prominent source of revenue to the state of Arkansas for a long time and will continue to be in the future as long as we as Arkansans can maintain and preserve the natural resources we are given as well as use our own to further progress the waterfowl industry in Arkansas. Through aerial surveying and requiring hunters to purchase licenses and stamps to legally hunt waterfowl as well as conservation efforts from the Arkansas Game and Fish Commission paired with other organizations, it has become much easier to determine just how many ducks are utilizing Arkansas as well as how many hunters are harvesting waterfowl during the year within the state. This paper discusses some of the main influences on the waterfowl population in the state of Arkansas and whether or not they are positively or negatively affecting it.

11:30 am Brown #17	The Effects of Artificial Insemination on Beef Cattle in the United States	Abby Shelnut Allee Sweeten Madison Dickey	Tatum Simms
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Artificial insemination (AI) is a reproductive procedure that is widely used in cattle industries and other livestock in order to increase pregnancy rates. Breeders must wait until the animals are in the estrus part of their estrous cycle to AI. Artificial Insemination is conducted by loading a semen straw into an inseminating gun, inserting the gun into the vagina of the heifer, and making sure it gets past the cervix by palpating with the other hand. Once past the cervix, the semen can be distributed in the heifer. Artificial Insemination is a breeding method that comes with advantages and disadvantages. Artificial Insemination increases genetic variation within the herd, the farmer can choose specific bulls with superior genetics, the farmer gets to deal with fewer bulls, and it narrows the time frame for herding. Some disadvantages include having to invest time in synchronizing the estrus phase of the animals, and the cost that comes with the equipment and professionally skilled laborers. To conduct this research, scholarly articles were gathered by searching keywords that pertained to the topic. The results include a figure that shows the comparison between multiple reproductive procedures in beef cattle and a table that compares the pricing of AI versus natural breeding. The figure supports that adding resynchronization to the AI process during the procedure was beneficial in increasing the number of pregnancies in beef cattle by reducing the interval time between AI of each cow. However, the greatest difference was the low cumulative pregnancy rate of heifers reproducing through natural service compared to any of the other herds who went through AI. The table compares the costs between AI and natural breeding in herds. Even though less bulls are needed to be purchased when conducting AI, the total breeding costs of those using AI is higher than the natural service. However, the pregnancy rate is 5% higher for those going through AI. There are benefits to both breeding options, but it is supported that AI is more successful in mass production industries.

11:30 am Brown #18	Fighting Malnutrition in Kenya	Tara Ross Jessica Payton Addie Nehus	Tatum Simms
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Malnutrition is a global health issue that severely affects many countries, including Kenya. Malnutrition may be defined as the lack of proper nutrients, caused by not having enough to eat, not eating the correct things, or being unable to properly utilize the food that one does consume. Malnutrition affects everyone differently, but a few major characteristics include severe weight loss, reduced muscle mass, swelling and inflammation, and an increased risk of disease or infection. There are multiple factors contributing to Kenya's malnutrition problem; such as poverty, general lack of information, and political/economic conflicts, but this study will be primarily focused on the severe drought that they are experiencing. Throughout history droughts have been a leading factor in the rising rates of starvation in Kenya. We will be discussing the severity of Kenya's malnutrition epidemic, and different things that could be implemented to reduce the malnutrition rates. A few ways to help aid in Kenya's malnutrition problem are nutrient fortification/supplementation, improvements in agricultural systems and nutrient diversity, and community implementations to enforce the access to proper nutrition. Nutrient fortification is more cost-effective than nutrient supplementation, for example, iodizing salt can cost as little as 0.05 U.S. dollars and wheat fortified with iron only 0.12 U.S. dollars yearly. Kenya is implementing a new strategy to improve agricultural operations, their mission is to provide access to more nutritiously diverse foods and enhancing community production. Additionally, a group called Feed Africa, is successfully using regenerative farming techniques to improve agriculture production. A few of these techniques include implementing grazing rotations to avoid depletion and educating locals on regenerative farming.

11:30 am Brown #19	The Demographic Shift of Males and Females in Veterinary Medicine	Dalton Tatum Mia Ratliff Eddy Patterson	Tatum Simms
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The workforce in veterinary medicine saw a gender shift from a male dominated field towards women in the present day. This research aimed to determine why this shift occurred through demographic analysis and surveys to different job types in this career path. By using this data, the group determined that one of the biggest impacts of the shift is due to the very component that makes veterinary medicine such a tough field, and it is located at the graduate school entry level. The competitiveness level is intertwined through all of the data and leads to the conclusion that females are simply outcompeting males at the entry level which does not allow as many males into the field as commonly. Further research can be conducted at a graduate school level to narrow down the results of the study.

11:30 am Brown #20	Inflation in Pope County	Courtney Remson Kyley Stone Amanda Skuban Shyane Ferguson	Syed Meerza
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The last few months, prices are continuously increasing from the grocery store to the gas station. The higher prices make it difficult for US consumers to afford everyday essentials. The main goal of this study is to estimate inflation in the Pope county area. We used the consumer price index (CPI) to estimate the change in prices paid by Pope county consumers for food, fuel, and other essential products. Our preliminary analyses show that prices in the pope county area declined in March 2023 compared to January 2023. In other words, the inflation rate in Pope county is declining.

1:30 pm Brown #1	Examining Tornado Data Since the 1950s for Recent Changes	Taylor Seiter	Herbert Brown
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This study will investigate the recent changes in tornado data from 1950 to the present. The changes include: the position tornadoes are located, the severity of the tornadoes and other factors. These shed light on where the increase of severity and numbers of tornadoes originated from as well as the shift away from the traditional Tornado Alley. Determining the cause of this theorized shift is important, however, there is a more pressing question on if the alley has shifted. In this study, regression, change point analysis, and random forest modeling were the three analytical techniques used to answer the three questions: Do data indicate a statistically significant shift in the frequency of tornadoes?; Do data indicate a statistically significant shift in the location of tornadoes?; Do data indicate a statistically significant shift in the strength of the tornadoes? The raw data from the NOAA weather database arrived with many columns of data describing specific factors about each tornado recorded such as the starting and ending longitude and latitude, magnitude, and the year it occurred. It was found that the variables most useful for data analysis were year, latitude, longitude, magnitude, season, and afternoon. These variables were used to organize the data, perform analysis, and present findings.

1:30 pm Brown #2	Charge to Mass Ratio of an Electron	Quinlin Reynolds Tori Freeman	Jessica Young
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The purpose of this experiment is to confirm the e/m ratio and charge of an electron discovered initially by J.J. Thomson. We use an electron beam generated inside an e/m tube and Helmholtz coils that generate a magnetic field which deflects the path of the electrons. The radius of the path can be measured and from there the magnitude of the magnetic field and the charge-to-mass ratio can be found. This experiment was successful in confirming the results found by J.J. Thomson and his cathode ray experiments. The results of this experiment had a 0.5% error with the accepted c/m ratio value of  $1.76 \times 10^8 \text{ N/A}^2$ .

1:30 pm  
Brown #3

Residence Camps for Youth with  
Physical Disabilities

Amberlin Piles

Michael Bradley

A residence camp often called an overnight or sleepaway camp consists of a facility or campsite that is utilized for the purpose of camping and requires an overnight stay. Residence camps are a popular summertime commodity. Youth with disabilities can benefit from residence camps because it allows them to have a sense of belonging while being surrounded by nature and varying aspects of inclusion. The programming at residence camps for youth with disabilities can consist of indoor or outdoor activities, designed and modified to accommodate the needs of individuals to enjoy and feel included. With positive feedback from participants and their families, disability-specific camps have been proven to benefit youths with disabilities in numerous ways through programs and opportunities. Maintaining safe and inclusive opportunities for youth to access disability-specific summer camps and programming plays a significant role in the positive feedback and facilitated success. The continuation of these programs will allow youths with disabilities to apply the numerous accomplishments, experiences, and skills that they learned into adulthood.

1:30 pm  
Brown #4

Using the 5-E Model of Inquiry  
Instruction for Teaching

Michaela Owens  
Melody Beasley  
Kinsey Boone  
Grace Carpenter  
Caitlyn Deal  
Emily Qualls  
Mollie Wisner

Suparna Chatterjee

This research highlights how we engage ourselves in learning about science phenomena using the 5-E model of inquiry-based instruction leading to explanations based on evidence. The 5-E model focuses on the five phases such as engagement, exploration, explanation, elaboration, and evaluation. The phenomenon we studied is that animals have traits inherited from parents which is a performance expectation in the Next Generation Science Standards (3-LS3-1). We worked in groups, completed the experiments in four weeks, collected data, analyzed and interpreted the phenomenon of inheritance of traits in *Drosophila*, fruit fly. We used *Drosophila*, a model organism because its life cycle is ten days and there are several contrasting traits available in different fly strains in the natural population such as red versus white eye color and straight versus curly wing which are useful to demonstrate patterns of inheritance in the animal world. We will discuss our findings on how we utilized the knowledge acquired through our research in designing experiments and developing lesson plans using the 5E model of instruction for teaching the phenomenon in elementary grades.

1:30 pm  
Brown #5

Study of Chemistry in Surface  
Water of Lake Dardanelle on  
Two Days by Measurement of  
pH, Temperature, and Dissolved  
Oxygen

Brooke Rainwater

Charles Mebi

This study measured pH, temperature, and dissolved oxygen on the surface of Lake Dardanelle in Dardanelle, AR, and used these variables to draw conclusions about the environmental conditions of the lake and how human activity affects these variables. In relation to pH, Lake Dardanelle is very similar to other eutrophic lakes. It has pH range of neutral to basic with little variation across the surface. In relation to temperature, it was found that across a large portion of the lake, temperature is not largely affected by human activity and is most influenced by air temperature. It also shows that lake water temperature can exceed air temperature in the right conditions. In relation to dissolved oxygen, the conditions were not appropriate to observe the change associated with temperature, as rain affected the concentration. It showed that water mixing can change the surface dissolved oxygen concentration, and watercraft activity may lower dissolved oxygen by stirring up sediment and adding compounds to the water.

1:30 pm  
Brown #6

Perceptions of Varying Types of  
Health Conditions Among  
Arkansas Tech University  
Students

Leala Sorrell

Julie Mikles-  
Schluteran

Attitudes towards minor ailments, psychological conditions, chronic illnesses, and disabilities were measured among students of Arkansas Tech University through an online questionnaire. 10 questions were asked for each condition type for a total of 40 questions. Participants were asked to rate their level of agreement from 1-5, 1 being "highly disagree" and 5 being "highly agree". Low scores (higher response rate of "strongly disagree") represented attitudes of Talcott Parsons' sick role theory. High scores (higher response rate of "strongly agree") represented attitudes of the ICF model and inclusiveness. The minor ailments/illnesses scale had the lowest mean score of 27.186. The disabilities scale had the second-lowest mean score of 29.124. The psychological conditions scale had the second-highest mean score of 30.340. The chronic illnesses

scale had the highest mean score of 31.588. Findings suggest that on average, Arkansas Tech University students hold moderately inclusive attitudes toward health conditions. Statistical significance was found between the condition scales, suggesting that participants did not regard or treat condition types as the same. Keywords: health, attitude, conditions, sick role theory, Talcott Parsons, ICF model, inclusiveness

1:30 pm  
Brown #7

Assessment of Student Success  
Assignments

Daniel Presler  
Journi Goforth  
Hannah Anderson

Dana Tribble

The purpose of our research is to assess the students' ability to achieve specific outcomes outlined in the student success course objectives. We will determine if the students achieved the outcomes by observing their grades for the assignments that align with our two specific course objectives. The course objectives are to identify the value of a diverse environment and to develop strategies to promote overall wellness.

1:30 pm  
Brown #8

Automatic Detection of  
Pneumothorax from Chest X-ray  
Images

Md Nurur Rahman  
A K M Rubaiyat Reza  
Habib  
Corbin Humphrey

Afsana Ahamed

Pneumothorax refers to air between the lungs and the chest wall, called the pleural space which results from leaks in the lung. Small or medium sized pneumothorax is not life threatening if it gets diagnosed in the early stages, but large ones can lead the patient to death. Detecting pneumothorax from X-ray images requires expert radiologists to diagnose it. To overcome the shortage of radiologists and accelerate the diagnosis, and providing a second opinion to the radiologist, a Computer Aided Design (CAD) can be of great help. Throughout recent years, lots of research has been done to build a robust model for automatic detection of pneumothorax from chest radiographs proposing several frameworks based on artificial intelligence techniques. We are summarizing the existing literature for pneumothorax detection from chest x-rays along with describing the available chest radiographs datasets. It will help the researchers to select the optimal and most effective model with respect to the real-time scenarios. The comparative analysis of the literature is provided in terms of quality and usability along with highlighting the research gaps for further investigation. From the literature, it is evident that pneumothorax is more common in men as compared to women. Additionally, the proposed models have achieved incredible results for pneumothorax detection on selected datasets, however, the effectiveness of proposed models in real-time cases cannot be claimed, as none of the models have been implemented clinically yet. This issue can be solved by external validation of the models. Furthermore, the class-imbalance problem in most of the medical image datasets has been solved by algorithm-level-techniques. Moreover, there is need to put more effort in combined detection and localization of pneumothorax as mostly research is limited to either classification or localization of pathology. So far, the best results have been achieved by deep-learning based models with Area-under-receiver operating-characteristic-curve (AUC) of 88.87% for classification, and Dice-similarity-coefficient (DSC) of 88.21% for localization of pneumothorax. Thus, the outstanding abilities of deep learning techniques can be deployed for developing robust models for pneumothorax detection.

1:30 pm  
Brown #9

Career Services: Incorporating  
Social Justice In Career  
Development Of College  
Students.

Catherine Owusu Appiah

Rene Couture

The purpose of this study is to discover how social justice concepts can be used in career services for college students. Traditional career services may only help students look for jobs and make resumes; however, this study shows that there is an opportunity to add social justice ideas to these services to better meet the needs of all of the students. By using ideas like equity, diversity, and inclusion, career services can help students determine what they want to do with their careers in a more whole and socially responsible way. A survey was given to college students as part of the study to find out how career services with a focus on social justice have affected their career development. The results of this study can help shape how career services are run in the future and add to a larger discussion about social justice in higher education.

1:30 pm  
Brown #10

Marketing Campaign for Pope  
County Habitat for Humanity

Hailey Addison

Megan Toland

Habitat for Humanity is a non-profit organization that assists families by building them homes. Habitat raises funds, interviews families in need and chooses a candidate, builds a home, and then gives the house to the family. What sets this organization however, is that they give a "hand up, not a hand out". Instead of just giving them a house, they require the family to help build it. Also, the family is expected to pay an affordable mortgage back to Habitat. This philosophy promotes a sense of ownership in these new homeowners, and hopefully that will encourage them to take good care of the property. Habitat for Humanity in Pope County has been active for ten years, but many locals still do not know that a Pope County branch exists. This lack of awareness severely limits the donations that HFHPC receives, which in turn hinders the home-building process. Therefore, my project was to create a marketing plan that would spread awareness of the Pope County branch of Habitat for Humanity, and to raise money for their 2022-2023 house build. The project was very successful! We raised over \$2000 from two cookie jars sales that I

organized and hosted with the help of the HFHPC board members. Our sales were also featured in three different newspapers, so that raised a lot of awareness for the Pope County branch of Habitat for Humanity.

1:30 pm  
Brown #11

Fake Profile Detection on Social  
Media Using Generative  
Adversarial Networks

Edidiong Akpan

Indira Dutta

The online social networking trend has been on the increase. As of October 2022, there are 4.74 billion users of online social media, which is 59% of the population of the world. This is an increase of 190 million users since the same time last year. People are using newer versions of social media every day to stay connected not only with their contacts but also with the latest trends. Users can follow, comment on, and share information that they might find online with their friends or followers. Since it is difficult to keep a check on the authenticity of a user, false personas are increasingly being used to contaminate online channels. Since current bot accounts and fake profiles have eluded detection by existing safeguards like captcha, we are looking into using GANs, a machine learning algorithm, to identify bot accounts more accurately to tackle the threat of social media crimes. With the help of recognized bot accounts, GANs train their own generator and discriminator models by which they will understand the patterns of such profiles and the relationship between the bio information, profile image, messages sent out, time frame of updates, and followers. It creates these false profiles and then uses the method to identify and categorize profiles. The effectiveness of a system will be tested on the generator and discriminator models to see how well they are able to identify phony profiles.

1:30 pm  
Brown #12

Classification Analysis with  
Spiking Neural Networks

Md Minul Alam

Tolga Ensari

Spiking neural networks (SNN) is a type of artificial neural networks (ANN) that gives more efficient results than the traditional neural network models. As a biologically inspired neuroscience-based method, SNN mimics the brain neuron structure. Traditional ANN models uses dense input with massively parallel feeding method. Unlike ANN, SNN neurons only fire the related input. Therefore, it saves energy and time in terms of information processing. In addition, it reduces the complexity and cost of the application. SNN have many potential application domains in artificial intelligence (AI) such as computer vision, text mining, neuromorphic computing, bioinformatics, medical sciences, robotics, finance, and others. SNN can also solve bottleneck of the Von Neumann computer architecture with new in-memory computing, near-memory computing, and neuromorphic computing designs. Since, the growth rate of the data is very fast, we need processors that are more powerful and better memory technologies. Additionally, SNN can be implemented with deep learning algorithms. In this study, we have some preliminary results on data classification with SNN in terms of performance metrics.

1:30 pm  
Brown #13

Characterizing Mid-IR sources in  
the Galactic Center

Zachary Stephens

Matthew Hankins

We present a comprehensive catalog of mid-infrared sources in the Galactic Center, utilizing data from the Stratospheric Observatory for Infrared Astronomy (SOFIA) at 25 and 37 microns. This current version of the catalog has gone through many updates to improve quality control and also add information on morphological properties of sources. We are in the early phases of trying to identify Young Stellar Objects (YSOs) in the catalog, and measure physical properties of these objects like effective temperature and luminosity using additional archival infrared datasets. The SOFIA data provide important information on star formation in the Galactic Center with spatial resolution ( $\sim 3'$ ) sufficient to disentangle many of the complex mid-infrared sources in the region. As a whole, the catalog is a valuable resource for understanding a wide variety of sources in Galactic Center.

1:30 pm  
Brown #14

What is the Relationship  
Between Proximity to the  
Mississippi River and Life  
Expectancy?

Hannah Stone  
Savannah McLaughlin

Julie Mikles-  
Schluteran

There is an apparent lack of literature to review on life expectancy patterns in relation to the Mississippi River, and that which is available is not always academic ('Greenpeace Report Looks at Mississippi Pesticide Runoff Called River Scourge' 1989; Anonymous 1989). Furthermore, there is a lack of research into Arkansan life expectancy in particular. Given the data patterns which indicate that Arkansas border counties to the Mississippi and the Arkansas rivers have a lower life expectancy than the state average, and the relevant literature on the toxicity of the Mississippi's waters, further research is warranted into the effect of the Mississippi River on Arkansan life expectancy (Biddle 2018). Based on the review of the literature and in accordance with environmental health theory, the primary investigators of this study hypothesize that proximity to the Mississippi River is related to adverse effects on life expectancy. Furthermore, the investigators of the study predict that Arkansas counties closest to the Mississippi River will report lower life expectancies than the Arkansas average.

1:30 pm  
Brown #15

Acoustic Sampling of Arkansas  
Bat Species Richness Across

Lark Sybrant

Jorista Garrie

## Different Seasons and Habitats

Arkansas is home to sixteen bat species belonging to the Vespertilionidae and Molossidae families. Bats are keystone species and provide numerous ecosystem services that also benefit people. However, many bat species are experiencing declines related to human induced factors such as habitat destruction, disease spread, and climate change. This study explores factors that impact species richness between the spring and fall seasons in a wooded rural site (Washburn Park) and an urban field site (Arkansas Tech University campus), Russellville, AR. The non-invasive Echo Meter Touch 2 Pro, from Wildlife Acoustics, was used to record calls and identify bat species from these locations. Nearly 1,050 bat calls were recorded from 11 different species across the spring and fall seasons between both sites. Results showed that there was significantly greater species richness in the spring (10 species detected) compared to the fall (9 species detected). No other variables examined were found to have significant impact on species richness. Although number of calls are not indicative of population size, we also wanted to see what impacted call numbers. There were significantly more bat calls detected during the spring compared to the fall and fewer calls detected at Washburn compared to the ATU campus. Lastly, there were significantly more calls detected during the waxing crescent moon phase compared to the waning crescent phase. While results show that bats utilized both sites throughout the seasons, the sheer number of calls detected at the ATU campus, compared to Washburn, could be indication of more suitable resources.

2:45 pm  
Brown #1

Photoelectric Effect

Lee Thompson

Jessica Young

This experiment investigates the photoelectric effect, which refers to the emission of electrons from a metal surface when exposed to light. The experimental setup involved a photoelectric tube, a variable voltage source, a mercury light source, and a set of filters. By measuring the stopping voltage required to halt the flow of electrons and the corresponding frequency of the light source, the work function of the metal was determined, and Planck's constant was verified. The results showed that the classical expectation that the emitted electrons should depend on the intensity of light failed, and instead, the modern explanation that the energy of the emitted electrons depends on the frequency of the light was observed. The implications of these findings are discussed, including the importance of the photoelectric effect in the development of quantum mechanics and modern physics.

2:45 pm  
Brown #2

Kinetic Energy of Hyper Velocity Rod Bundles

Dagan Shoesmith

Jessica Young

This research project focused on investigating the kinetic energy of hypervelocity rod bundles as they are launched from space. The objective was to determine the change in kinetic energy as a function of altitude using calculus. To achieve this, the researcher derived equations and developed a final equation that can calculate terminal velocity and kinetic energy. The calculations were based on the assumption that the hypervelocity rod bundles have a constant mass, cross-sectional area, and drag coefficient. The findings indicate that as the hypervelocity rod bundles approached the surface of the Earth, their kinetic energy decreases significantly due to an increase in air resistance. The final equation developed in this study provides a useful tool for predicting the kinetic energy of hypervelocity rod bundles at different altitudes, which can be used in the design and planning of orbital defense systems.

2:45 pm  
Brown #3

Antibacterial Properties of Devil's Walking Stick and Winged Sumac Extracts

Raven Turner  
Kayla Medina

Suresh Subedi

Many native plants are used for the treatment of various diseases. Mainly those species in high chemical compound plant families can have antimicrobial properties. We selected two native plants in Arkansas, Devil's walking stick (*Aralia spinosa*), and Winged sumac (*Rhus copallinum*), and tested them for antibacterial properties. We used three gram-positive bacteria (*Bacillus cereus*, *Bacillus subtilis*, and *Staphylococcus epidermidis*) and three gram-negative bacteria (*Alcaligenes faecalis*, *Escherichia coli*, and *Serratia marcescens*). The disc diffusion method is employed to identify any potential antibacterial properties for the two plant species. For this experiment, 6.50 g of dehydrated plant material (leaves of each plant species) was combined with 50 mL of 75% ethanol creating their respective tinctures which were processed to remove alcohol and make powder samples. The antibacterial activity of the powders in sterile Milli-Q water was tested against 75% ethanol and hydrogen peroxide controls. After 24 and 48 hours of incubation at 37°C, the zones of inhibition were measured for each bacteria/plant sample combination. The plant samples were tested for inhibition of each bacterial species. We used nested ANOVA (analysis of variance) to examine the effect of different concentrations of plant samples and two different incubation times (24h and 48h) of each plant species on zones of inhibition for six different bacteria. Preliminary investigations showed antibacterial properties in the samples. This indicates that native plant species can have potential medicinal properties.

2:45 pm  
Brown #4

China's Public Diplomacy Philosophy

Logan Webb

Patrick Hagge



China has become a giant in such a short period of time and in a globalized world. This led me to the research question, “what is China’s public diplomacy philosophy?” Using a textual analysis of major geopolitical events that China is involved in (The Belt and Road Initiative, the South China Sea dispute, Uyghur imprisonment, and the Hong Kong government takeover) and the history of China since the Chinese Civil War, it becomes apparent that the country uses the concept of hard and soft power for its public diplomacy. If a country is not receptive to China or its intended actions, then China responds with big-stick diplomacy and forceful intimidation. If a country is willing to cooperate with China in its ventures, which are usually countries that are not considered prominent in geopolitical affairs, then China responds with intimidation through monetary and social persuasion. This is a derivative project; it creates no new knowledge of its own but connects the dots of existing knowledge in ways that illuminate China’s geopolitics.

2:45 pm  
Brown #5

The Media Intervenes: Tulsa's 1921 Massacre and the Destruction of the Greenwood District

Maclain Wheeler

Kelly Jones

This scholarly research paper focuses on the 1921 Tulsa Race Massacre, specifically the ways in which the media progressed and intensified the events the Greenwood community faced. A vibrant community filled with opportunity and promise, Greenwood welcomed any African American who accepted its warm embrace. Ransacked and burned to the ground within two days, Greenwood residents were forced to reckon with the destruction. Greenwood became unrecognizable. Properties and possessions that had taken people many years to acquire were gone within a matter of hours. The framing put forth by the Tulsa Tribune provoked much of the white public and encouraged the destruction of Greenwood in its entirety. Some whites did pity the inhabitants of Greenwood, whereas other mocked the fallen community. The Tulsa Massacre shows how certain narratives can be crafted to inflict unnecessary violence on individuals or societies. Public recollection of the destruction and its aftermath almost disappeared entirely. Individual recollection, however, did not. Survivors feared sharing their stories. Repercussions on those who lived through the massacre extended beyond the loss of their homes and businesses; it bore trauma that would be transferred among future generations. Though this trauma was not well understood for many years, it shaped the way in which these other generations viewed race, the world, and Tulsa specifically. Over 100 years later, the question of how reparations can be made to the victims of the massacre and their families remains. Reparations will never be able to fully account for the trauma, devastation, and loss the massacre caused for the members of the Greenwood community. However, framing the story to discredit the misconceptions of the events and apportion blame where it is due is a step in the right direction. Historical justice will only be met if knowledge of the massacre continues to integrate itself within our society in the years to come.

2:45 pm  
Brown #6

Nest Success and Fledgling Sex Ratio of American Robins (*Turdus migratorius*) in Suburban Areas of the Arkansas River Valley

Brandon Maersperger

Chris Kellner

The American Robin (*Turdus migratorius*) is an abundant North American songbird species that thrives in suburban areas. Estimates of robin nesting success in suburban areas range from 31% to 90%. Robin nest site selection and success have not received much attention in the past few decades. Most passerines have a balanced sex ratio at fledging, but little is known about the fledgling sex ratio of robins. We located 44 robin nests in six public parks around Russellville, AR and on the Arkansas Tech University campus. Nest success was low; 27% (12/44) of nests fledged at least one young. Robins nested most frequently in American Sweetgum (*Liquidambar styraciflua*), Crape Myrtle (*Lagerstroemia indica*), Pin Oak (*Quercus palustris*), and Willow Oak (*Quercus phellos*), but were also found nesting on buildings early in the breeding season. An average nest was approximately 5 m off the ground and was 66% concealed by vegetation. Fledglings survived for an average of twelve days and half of the fledglings (7/14) survived for less than seven days. Low fledgling survival in combination with low nesting success suggests that robin productivity was low in 2022. Environmental stressors like drought can lead to shifts in avian sex ratios. The sex ratio of fledgling robins we banded was skewed towards females (15:7). Further study is required to determine what characteristics of the suburban environment may lead to low reproductive success for robins, and how robins deal with the challenges of breeding in poor-quality habitat.

2:45 pm  
Brown #7

The Quality of Life for Single Parents

Cindy Collet  
Chase Chance  
Taylor Davis

Julie Mikles-Schluterman

Our research is about single parent households and issues that stem from that. The literature we used discusses issues that relate to poverty. Our variables come from fact sheets distributed by the Arkansas Department of Health, which uses statistics from the United States Census Bureau. Our statistics were consistent with the literature. Single parent households are more likely to experience food insecurity and more likely to be in poverty.

2:45 pm  
Brown #8

Developing a Calorimetry-Based  
General Chemistry I Lab Using a  
Double-wall Calorimeter

Dalton Wisdom

Subha Pratihar

Calorimetry is a technique that allows us to measure the heat gained or lost during a chemical reaction. The measured heat, or the change in enthalpy, results from the breaking or forming of bonds in a chemical reaction. Calorimeters are generally thermally insulated reaction vessels consisting of a heat sink that can absorb or provide thermal energy to the reaction of interest. The goal of this experiment is to calibrate and obtain standardized values for a double-wall calorimeter that will be used by students in general chemistry lab courses. Standardization of the calorimeter was accomplished by performing four separate experiments: the determination of the heat capacity of the calorimeter, an endothermic reaction, an exothermic reaction, and the heat of neutralization of the calorimeter. Once these standardized values were obtained, they were compared with literature values, where applicable. The calorimeter used was economic, only around \$30; however, results from determining the heat of neutralization indicate that this calorimeter is a viable option for smaller universities with lower budgets. The literature value for the heat of neutralization of NaOH and HCl is  $-57.3 \text{ kJ/mol}$ . Our experimentation yielded a heat of neutralization (with 95% confidence) of  $-65.39 \pm 8.594 \text{ kJ/mol}$ , which gives a 14.12% relative error—well within acceptable error range. Additionally, a reaction of magnesium metal and HCl, an exothermic reaction, has a literature value of  $-466.85 \text{ kJ/mol}$ . Our experimentation yielded an enthalpy change of (with 95% confidence) of  $-403.49 \pm 68.182 \text{ kJ/mol}$ , which gives us a 13.57% error—again within acceptable error range. Standardization of this double-wall calorimeter aids instructors by giving them resources needed to create lab procedures for students. Students can also benefit from these standardized values because they can compare their experimental results with standardized values for the calorimeter.

2:45 pm  
Brown #9

Riparian Plant Species of  
Arkansas River and Their  
Phytoremediation Ability

Kade Zeiner

Suresh Subedi

Riverine system offers many kinds of ecological services which benefit multiple ways especially for suburban or urban areas. However, with the acceleration of urbanization and rapid development of economy, river pollution problem is becoming more and more critical. Phytoremediation using native plants offers one potential solution for remediating soil contaminated with pollutants. Plants called hyperaccumulators can absorb high levels of pollutants without being poisoned themselves. Hyperaccumulators take up toxins in soil or water -- including heavy metals, radioactive contaminants or petroleum products -- in a process called phytoremediation. In this project, I determine to study riparian forest in Arkansas River near to Russellville area. By identifying pollutant accumulator native species and employing them for phytoremediation in pollutant areas, we can help improve soil and water quality, especially with regard to heavy metals. Therefore, my objectives in this study are two folds, 1) to perform vegetation survey and find out if vegetation composition of riparian areas around Russellville (high, intermediate and low pollution areas) difference in relation to their proximity of human development/activity, and 2) to investigate phytoremediation ability of riparian forest native species. Plant species composition vary across sites with different levels of pollution. Some native plant species can accumulate heavy metal in their tissues (i.e., hyperaccumulators) and improve environmental quality.

## Virtual Presentations: [1st Annual ATU Research Symposium](#) | [ATU Research Symposium](#)

Time & Location	Title	Presenters	Faculty Mentor
9 am -4 pm	Natural Disaster Preparedness Levels Among Firefighters	Shelby Coonts	Bethany Swindell
<p>The primary problem is the lack of information of the disaster preparedness within Hinesville and Liberty County, Georgia fire services. The purpose of this quantitative comparative study was to (a) establish the current level of disaster preparedness and (b) analyze and compare the differences between Hinesville City Fire Services and Liberty County Fire Services located within the same region of Southeastern, Georgia. This research sought to benchmark the organizational level of disaster preparedness of two critical departments (City and County Fire Services) by measuring three key attributes (knowledge, skills and personal preparedness) for disasters. The research collected data by using the Disaster Preparedness portion of the Disaster Preparedness Evaluation Tool (DPET) via an in person brief and survey. The DPET measurement tool produces scores for each organization and determines the overall organizational mean level for knowledge and skills regarding disaster preparedness. The differences in organizational preparedness across City and County Fire Services will be observed and discussed.</p>			
9 am -4 pm	Little Rock's Unique Political Opportunities for Black Arkansans	Isaac Cross	Kelly Jones
<p>The influential Arkansas urban center of Little Rock experienced a unique situation in terms of political office holding opportunities in the late nineteenth century. Unlike the rest of the state, Little Rock contained a prominent black community that earned formal political office holding in the local and state government. The current historical scholarship on the state's African American experience focuses on the overall broad picture of Arkansas. There is a lack of detailed treatment on black Arkansans in Little Rock and their political realities during the late nineteenth century. Using newspapers, census data, local and state documents, and all available secondary literature, this thesis will display the unique position of the state's capital for black Arkansans. When exploring the details of Little Rock and its impact on the state, a complete picture can be constructed of Arkansas Reconstruction and the African American experience.</p>			
9 am -4 pm	The Effects of Covid-19 on Business and Marketing	Makayla Henderson	John Narcum
<p>The coronavirus pandemic had produced many unprecedented challenges in terms of marketing, but it has not all been negative. The world crisis caused a major shift to online which produced new and innovative marketing strategies. Marketing was able to become somewhat better resulting from the coronavirus pandemic. However, the shift towards an online world also initiated a flooded marketplace where competition was high. Time and money become issues for many marketing departments as they were forced to react quickly and work with decreasing revenue. Marketing had to find methods to combat supply chain issues, remote work, and learn to communicate well to keep consumers informed and happy. Their communication efforts should also build customer loyalty as this is difficult to come by. Social media aids these efforts by keeping the consumer informed while building upon the relationship and was one of the few methods to reach consumers during the pandemic.. Consumers had less face-to-face interaction, so marketing was responsible for the majority of a consumer decision. Marketing also played a prominent role in presenting the value and need for items in an extremely unstable economy consisting of unsure consumers.</p>			
9 am -4 pm	"Laziness" and How It Affects Our Students	Jillian Jenkins	Arwen Taylor
<p>This article analyzes the use of the term "lazy" in the educational setting, how this term affects students, and the pedagogical approaches educators can take within their subject areas to reduce stress for their students. Pedagogical decisions affect student stress, and this article provides suggestions to prevent student burnout in order to improve curricula offerings in secondary and higher-level classrooms. Results show that students often reduced to "lazy" are most likely struggling with an underlying cause for their lack of performance, such as stress, burnout, depression, anxiety-induced procrastination, unknown and undiagnosed mental challenges, and misguided apathy. Results concluded that to reduce student stress and increase intrinsic motivation, educators should avoid shaming students, provide rationale for learning, express interest in students, teach with enthusiasm, and contribute to building a positive learning environment.</p>			

9 am -4 pm

A Phenomenological Examination of the lived experiences of African American Female Superintendents in the State of Arkansas

Debra Myton

John Freeman

The purpose of this qualitative study was to examine the lived experiences of African American female Superintendents in the State of Arkansas. One of the major educational issues is the small number of African American female superintendents in the US and the state of Arkansas, in particular. African American women venturing into the superintendency are hindered in their goals by their double minority status as women and African Americans (Wiley et al., 2017). A qualitative, narrative research lens was used in this study to capture the individual career advancement of African American female Superintendents in the State of Arkansas. Data collection centered on personal, one-on-one interviews with African American female Superintendents in the State of Arkansas. The primary and guiding research questions for this study were focused on the women's backgrounds, experiences, and educational paths that led to their superintendent position. A series of common themes emerged from the interviews and produced a clear understanding of the path the female superintendents traveled to assume the most important decision-making role in their respective school districts. Key themes which emerged were leadership ability, leadership desire, and mentorship. Participants indicated they had developed a keen sense of self-efficacy, which led to broader goals and career advancements. In future research, it is important to analyze opportunities women have that help shape, encourage, and support other African American women moving into the role of Superintendent in the State of Arkansas. Keywords: Superintendent, African American, women, female, leadership, and Arkansas

9 am -4 pm

Helping with Classroom Management by Using a Timer

Annabelle Pulliam

Heather Stefanski

Research Question: 'Would giving students a set amount of time on a question help them focus on their work?' I conducted my research by displaying a digital timer on the teachers smartboard. The timer was used during the students' Bell Ringer to keep them engaged in their work. The students were given 5 minutes to complete their Bell Ringer. During the time of conducting my research students were given a project over animal extinction (Zoo Exhibit). The first day that the timer was displayed in the classroom was during the Bell Ringer that asked students to find an animal that was on the verge of extinction. The students had 5 minutes to look through a list of animals that interested them. Once the timer was done, students then had to tell the teacher what they would be doing their research project over. The Bell Ringer helped students get a good start on their project, and the timer helped the students focus on the assignment. The next day, the Bell Ringer was a 3, 2, 1 notes that asked students questions regarding their research project. The students were given 5 minutes to complete their notes which helped them stay focused on their work. By allowing students to complete this Bell Ringer assignment helped the students refresh their minds over the types of information that they found the day before. By giving the students a timer on the board, helped the students take responsibility in completing their assignments. The timers were a great success at reducing talking, distractions, and unfinished work. Students were more engaged in completing their assignments than before displaying the timer. The teacher that I was observing also said that the timer was a great success in her classroom.

9 am -4 pm

Occupational Therapy Interventions for a Patient with Carpal Tunnel Syndrome

Brianna Sparks

Robert Stevens

The purpose of this research project is to better understand the thought process of occupational therapists when deciding on an exercise plan, specifically on a hand injury like Carpal Tunnel Syndrome. It will also highlight the importance of occupational therapy in the rehabilitation process before and after surgery. The questions guiding my project are: How would an occupational therapist rehab a patient with carpal tunnel syndrome? What exercises help with what symptoms in a patient with carpal tunnel syndrome? What role does an OT play in getting a patient back to normal life after a surgery?

9 am -4 pm

River Valley Asset Mapping Project – Leadership Capacity

Whitney McQuiston

Jeff Aulgur

This project uses a strengths-based asset mapping process to document existing leadership capacity, representative leadership, and support structures among non-government, nonprofit organizations in Pope County, Arkansas. Individual asset mapping involves identifying and mapping the gifts, skills, and capacities individuals bring to the organization and the community and connections between leaders and organizations in the Arkansas River Valley. This asset mapping process aims to document, understand, and analyze leadership capacity, representation, resources, structures, and relationships within the community of small- and medium-sized nonprofit organizations in Pope County to facilitate understanding, community development, collaboration, and change.

## A SPECIAL THANK YOU TO THOSE WHO HELPED MAKE THIS DAY POSSIBLE:

- ATU STUDENT RESEARCHERS AND SCHOLARS
- ATU FACULTY

